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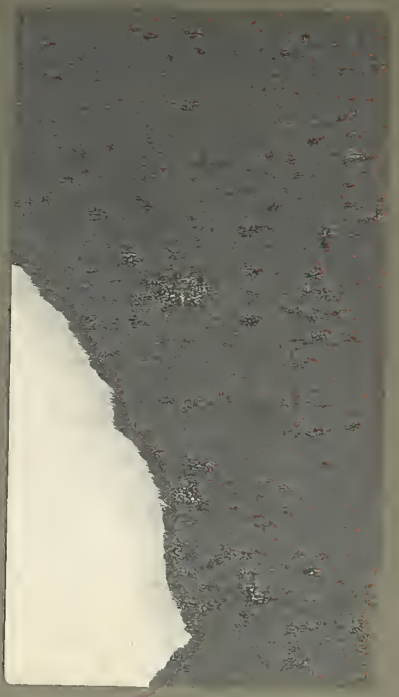

STREET DRUG ANALYSIS AND ITS SOCIAL AND CLINICAL IMPLICATIONS

Edited by: JOAN A. MARSHMAN

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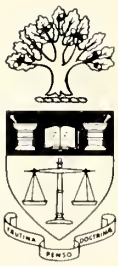

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INTERNATIONAL SYMPOSIA ON ALCOHOL AND DRUG ADDICTION

Presented by

JOHN A. MARSHMAN

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General Editor: S. L. LAMBERT

ALCOHOLISM AND DRUG
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Introduction

Although an illicit market system for drugs has long been a part of our society, recent years have brought significant changes in the street drug scene. Together with the introduction of a wide variety of hallucinogens, an increase in the proportion of relatively inexperienced adolescent users, and an unprecedented interest on the part of the news media, has come a situation in which drugs purchased on the street frequently do not contain the pharmacologically active material(s) alleged to be present.

Recognition of this misrepresentation has prompted the establishment of street drug analyses programs in both Europe and North America. These efforts have been variously directed to patient care, research into patterns of drug availability and use, education of users, health care personnel and the general public, and facilitation of law enforcement.

This symposium was designed to bring together individuals who have been involved in street drug analysis efforts, in order that they might share their experiences, determine what has been achieved by such programs, and consider appropriate directions for future endeavours. Those who participated represent orientations ranging from psychiatry and psychology to pharmacology and chemistry. They discussed street drug analysis experiences in Germany, Holland, the United States and Canada. Thus it was possible to achieve both interdisciplinary and international dialogue.

For some time now we have pondered a number of nagging questions about street drug analysis programs: what is the need for them? what are the legal and ethical considerations which bear on this operation? is the "credibility gap" on the illicit drug market a true bill, and if so, what is its significance? how effective are existing programs? how can they be improved? While the deliberations of this symposium did not yield ready-made answers to all of these questions they did contribute significantly to progress towards a rational approach for the maintenance and development of appropriate efforts in this area.

Joan Marshman

The Evolution of Counter-Culture Street Drug Analysis Program

David E. Smith[1]

INTRODUCTION

This paper chronicles my perspective on the evolution of counter-culture street drug analysis programs in the United States.

My initial exposure to and experience with street drug analysis began in 1965 in the Haight-Ashbury district of San Francisco. There, as a resident and physician, I saw the development of a psychedelic counter-culture which had as a basic component of its central philosophy the desire and need to alter consciousness through the use of a variety of psychoactive drugs not commonly available to or experienced by the dominant culture in the United States. The evolution of the counter-culture and its associated drug-taking practices has been described in a wide variety of articles and books, including *Love Needs Care: A History of San Francisco's Haight-Ashbury Free Clinic.* (1)

The new drug practices focused at that time primarily on the psychedelics: marijuana, lysergic acid diethylamide (LSD) and a variety of other relatively rare psychedelic chemicals. These drug practices were a complex interaction of physical, psychological, social, and cultural variables. The central theme seemed to be "better living through chemistry" with the belief that conciousness expansion and profound philosophical insights could be obtained through the use of drugs. As young people from all over the country flocked to this epicenter of the developing hippie culture, demand grew for these psychedelic chemicals which were either outlawed or under legal control by the American dominant culture and had no place in accepted medical or social practices. As a consequence, the psychedelic drug market place was totally clandestine and illegal in nature

[1] Haight-Ashbury Free Medical Clinic, San Francisco, Calif.

and there was no Food and Drug Administration or quality control mechanism operative to ensure the psychedelic consumer of the dose and purity of the drug he was ingesting. This lack of scientific information did not deter young people from experimenting with drugs. It did, however, facilitate the development of street mythology based almost entirely on personal experience and the interpersonal exchange of information concerning the properties of a particular drug, its strength, quality, purity, desirable effects and potential adverse effects. Therefore uninformed self-experimentation not only dramatically increased the incidents of adverse drug reaction, but also contributed substantially to inaccurate street drug information. This misinformation was unfortunately believed and used by physicians who attempted to treat young people with adverse drug reactions. Law enforcement authorities and society in general also believed this inaccurate information and the lack of accurate street drug analysis fostered a great deal of mythology that persists today both in the dominant culture and the counter-culture.

In June of 1967 the Haight-Ashbury Free Medical Clinic (HAFMC) was started, chiefly because the existing health care delivery system was not delivering and would not deliver adequate health care services to the alienated drug-involved youth in the flourishing counter-culture of San Francisco. With the mottos "Health care is a right, not a privilege" and "Love Needs Care", the Haight-Ashbury Free Medical Clinic attempted to develop a viable medical and psychological community-based alternative agency to deal with these neglected health problems.

One of the major aspects of the Haight-Ashbury Free Medical Clinic was its physical and psychological accessibility to the youth of the counter-culture. Health care delivery was given in a supportive, non-moralistic, non-judgmental manner, in marked contrast to the legalistic and moralistic approach of the dominant culture.

Consequently many young persons sought help at the Haight-Ashbury Free Clinic, most often during a drug crisis. It became quite apparent however that adequate treatment could not be delivered because of major gaps in information about the type of drug the individual had consumed. As an example, people came in stating they were having a "bummer" after taking "2 red dots" or "3 purple wedges" or "1 hit of blotter acid" and so on. The San Francisco street slang was not easily translated into establishment medical language. Even if the preparation were identified, very little was known about its properties. As a consequence, the treating physician or the paramedical talk-down guide was at a great disadvantage and his ability to respond adequately to the drug crisis was significantly impaired.

A classic example of this dilemma occurred soon after the Haight-Ashbury Free Clinic opened in June of 1967. When a new drug known as STP was introduced to the counter-culture, youth in the area stated that STP stood for Serenity, Tranquility and Peace. At one summer festival in June of 1967 in the Haight-Ashbury, 5,000 tablets were disseminated during a celebration. A great number of young persons came to the Haight-Ashbury Free Clinic acutely anxious, panic stricken, actively hallucinating and with a wide variety of confusing physical symptoms including muscle tremors, rapid pulse rate, and dilated pupils. This drug, STP, had never been identified or discussed in any previous medical literature and the medical team operating at the Haight-Ashbury Free Clinic had to base its judgment entirely on clinical observation. Rumor persisted that it was a stolen war chemical, synthesized by a super psychedelic chemist; other unusual and conflicting rumors were also widely circulated. As a consequence of a few initial cases of apparent aggravation of adverse drug reaction through the administration of high doses of phenothiazines, a clinical impression was formed that this substance was probably an atropine-like drug. However, staff at the HAFMC were able to obtain a large number of samples

and have them analyzed at the drug analysis laboratory of a nearby law enforcement agency where it was found that the psychoactive chemical was 2,5-dimethoxy-4-methylamphetamine (DOM), a quite powerful psychotomimetic amphetamine (2,3). Gradually it became apparent that the high incidence of adverse reactions reflected not only the fundamental properties of this drug but also the very high dosage in street preparations. (The tremendous variability of dosage in illicitly manufactured preparations is of real clinical significance since the effects reported from a laboratory study using a standardized low dose of the drug may differ markedly from the effects in individuals on the street who self-administer at much higher dosage levels.) As with all adverse reactions to the psychedelic drugs, we utilized the talk-down approach for a bad trip on STP, with secondary support from sedative-hypnotics where necessary and were able to treat most of the adverse reactions to STP successfully, particularly after the exact chemical was clearly identified. In addition the Clinic disseminated a large number of flyers describing the properties and potential adverse effects of this drug, with a resulting decrease in the incidence of experimentation with STP. Another crisis came with the introduction of the "peace pill", which on analysis was found to contain phencyclidine (PCP) (3). This information, too, we subsequently disseminated.

The technical resources available at that time for analyzing such drugs existed only in the dominant culture through the established legal or medical institutions and were mobilized for street drug problems only in times of crisis, as when STP and PCP were initially encountered. Further there was some criticism of the HAFMC community dissemination of this drug information, on the grounds that accurate street drug information would prompt young people to experiment with drugs. The Haight-Ashbury Free Clinic, as well as most other alternative organizations, disagreed with this position, feeling that accurate dissemination of street drug analysis information served in fact as a form of secondary prevention, reducing both the prevalence of adverse drug reactions and the spread of experimentation with drugs of higher abuse potential. However the technical laboratory facilities to analyze such drugs have continued to be tightly controlled by the established order, and only in times of major drug crises have we been able to get our preparations analyzed at a reasonable cost.

VARIETIES OF STREET DRUG ANALYSIS PROGRAMS

This early system, although effective in times of crisis, was poorly organized and inadequate to meet the needs of not only the drug consumer but also the clinician. An increasing number of clinicians wanted accurate information about current drugs so that they might better treat drug-involved individuals. One began to see then the development of a variety of formalized street drug analysis programs. Some were oriented to the youth counter-culture and others were of the established and traditional type. The first systematic attempt to analyze the growing number and wide variety of street drug analysis programs was made by Dr. Bing Hart under the sponsorship of the National Institute of Mental Health in association with the Haight-Ashbury Free Medical Clinic (4). This study described in great detail the different approaches and technical competence of the various street drug analysis programs. From the findings it became apparent that it was no longer easy to categorize street drug analysis programs, either those operating independently or those associated with agencies such as free clinics, law enforcement, or universities, on the basis of their being straight or hip, or being of the dominant culture or counter-culture.

In general the counter-culture street drug analysis programs had access to a large number of samples and had great credibility with the consumer population with respect to their dissemination of street drug analysis information; however, the technical and scientific aspects of these programs were, for the most part, quite inadequate, and Dr. Hart and his staff noted many weaknesses in the programs. Dr. Hart concluded that the university-based street drug analysis programs were superior to the purely counter-culture analysis programs in terms of technical accuracy. He felt that the best system in many cases was a partnership between counter-culture agencies and the university-based facilities. The agencies, accepted by the consumer population, collected the samples; the university analyzed them and released the information back to the agencies. For example the Do It Now Foundation's counter-culture street drug analysis programs (Appendix A) deliver good quality technical analyses of street drugs and also disseminate street drug analysis information in a fashion that is extremely valuable to consumer, helping agency, and the community at large. In contrast to PharmChem (Appendix B) which has its own technical analysis resources, the Do It Now Foundation depends on an excellent university-based street drug analysis program entitled the "Pacific Information Service on Street Drugs", a liberal but certainly not counter-culture agency (5). Another excellent example of this type of cooperation is the University of Maryland's street drug analysis program, under the direction of Dr. David Blake. It is interesting to note, however, that some university-based street drug analysis programs are themselves student-controlled and counter-culture in nature. An example is the University of Oregon program which is affiliated with the Whitebird Free Clinic. Their street samples are analyzed by counter-culture analytic agencies such as PharmChem. The information is then disseminated in objective and acceptable fashion to community helping agencies and consumers alike (6).

As shown in appendices C and E, some university-based and highly qualified street drug analysis programs disseminate their information primarily to physicians and other agencies and do not focus on the community at large or on the consumer. Of a more counter-culture nature, the Berkeley Free Clinic regularly reports via K.S.A.N., the most popular underground FM station in San Francisco, the results of their sample analyses in an attempt to upgrade the quality of drug education in the community through the use of such a mass media street drug information delivery system.

Appendices A – E and References 5, 6 show only a few of the many street drug analysis program reports that I, as a practising physician in the field of drug abuse, receive each month. I find these reports extremely valuable in terms of understanding and correlating drug patterns, getting a better idea of the current quality and purity of certain drugs, and becoming aware of the latest drugs of deception. An unfortunate aspect of the counter-culture drug market-place is that when the demand for a particular drug increases the drug is often cut with other substances for socio-economic reasons. If the synthesis or diversion of that particular drug is difficult, then other drugs of a less popular nature are substituted. Examples of this are numerous, including the substitution of DOM (STP), a potent but now feared drug, for mescaline, a popular and less potent psychedelic but a difficult drug to obtain; the substitution of PCP for THC, the active ingredient in marijuana almost never found in street drug analysis preparations, and so on. We at the Haight-Ashbury Free Medical Clinic translate this information into a form that our clients and our surrounding community can understand and use, thereby hopefully decreasing the incidence of adverse effects which result when the quantity or quality of a drug is not known.

DISCUSSION AND SUMMARY

It is apparent then that street drug analysis and information dissemination has become a widespread phenomenon in the United States. The nature of the programs range from the very traditional law enforcement drug analysis programs to counter-culture agencies. The former analyze samples primarily for the purpose of prosecution but during periods of drug crisis will consent to analyze street samples for the purposes of helping physicians involved in treating drug abusers. The latter regularly analyze street drugs and publish the street name, the true chemical name or actual ingredients of the sample and the cost of that particular material. It appears that the highest technical accuracy relative to drug analysis occurs in university-based facilities run by professionals. However, in my opinion, technical analysis of a substance is only the starting point toward an effective street drug analysis program. Such a program must, if it is to have significant impact, have an information delivery system that reaches the consumer and the potential consumer as well as those individuals who treat drug problems, and the community at large.

There is a great deal of variation in target populations for the dissemination of such information. Some programs focus primarily on the professional, whether doctor or law enforcement official. Other programs focus on the community at large and still others, primarily of a counter-culture nature, aim at the consumer, believing that accurate and objective drug information is an excellent form of drug education and secondary prevention to reduce adverse drug reactions and destructive drug practices. It appears to me that the best solution evolves around a well trained technical facility that can accurately analyze drugs in partnership with a counter-culture agency that has the confidence of and accessibility to the population at risk for the receipt of drug samples and information and for the dissemination of appropriate information.

Unfortunately, it appears that a large segment of the dominant culture still feels that by withholding accurate information about street drugs, young people will stop using such substances to alter their consciousness. I strongly disagree with this and support Dr. Andy Weil's hypothesis (7) that the desire to alter human consciousness is a basic human desire. Many persons will seek psychoactive chemicals as a vehicle for altering their consciousness depending on their philosophy, their psychological make-up, the surrounding socio-cultural circumstances and drug availability. The drugs they use will vary. However, just as the dominant culture demands to know what it is ingesting to alter its consciousness, the counter-culture also has a right to the same information.

I strongly feel that good, high quality street drug analysis programs with an adequate information delivery system will not only reduce the number of adverse drug reactions, but will also decrease in certain situations the spread of destructive drug practices which are in part based on inaccurate and dishonest information obtained not only from the street but also from the established order in the United States.

APPENDICES

Appendices A through E present examples of the wide variety of street drug analysis programs and information delivery systems available to physicians and community-based drug programs.

Appendix A.

Do It Now Foundation
P.O. Box 5115
Phoenix, Arizona

The Do It Now Foundation has offices in Los Angeles and Phoenix. Although they collect samples from all over the country they do not have their own analytical services and utilize established facilities at the University of Southern California and the University of the Pacific. The major emphasis of their program is the rapid dissemination of relevant, objective information through fellow alternative agencies, underground newspapers such as the *Los Angeles Free Press,* underground (FM) radio and mass mailings.

Appendix B.

PharmChem Laboratories
1848 Bay Road
Palo Alto, California

PharmChem has a good quality street drug analytical service and publishes a periodic newsletter which lists alleged content and origin of samples submitted, description of sample and actual content including price. In addition, PharmChem collaborates with various alternative agencies and free clinics in the rapid dissemination of information in situations where deceptions regarding the nature and dosage of the drug exist.

Appendix C

University of the Pacific
Pacific Information Service
on Street Drugs
School of Pharmacy
Stockton, California

An excellent university-based street drug analysis program which publishes a periodic newsletter describing test results as well as presenting a valuable narrative on individual drugs.

Appendix D

Whitebird Drug Information Center
University of Oregon
1 EMU
Eugene, Oregon 97403

A university-based, student-controlled street drug analysis program which works in close collaboration with the Whitebird Free Clinic. Samples are analyzed primarily by PharmChem and Whitebird focuses their efforts on sample collection and information dissemination.

Appendix E

Los Angeles County Health Department
University of Southern California
Drug Investigation Laboratory
Los Angeles General Hospital
Room 2900
Los Angeles, California

This high quality street drug analysis program is a collaboration between the Los Angeles County Health Department and the University of Southern California and is based at Los Angeles County Hospital. Their information reports and discussions of drug trends are sent primarily to doctors and people working in drug programs.

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Report on the Chemical Composition of Illicit Drugs

D. J. Mattke[1]

I would like to begin my presentation by referring to our experimental findings of street drug analysis in Munich. Using these, and findings of comparable investigations in the literature, I will try to focus on some of the questions proposed for discussion at this symposium.

METHOD

From December, 1970 to November, 1971 we investigated the illicit drug market of the Munich area. Our main interest was the quantitative and qualitative analysis of samples said to contain such hallucinogenic substances as lysergic acid diethylamide (LSD), mescaline, and psilocybin. One hundred and nine such samples were studied. In addition, 35 samples consisting of alleged opiate, hashish and amphetamine preparations were analyzed for specific reasons such as suspected admixtures (e.g. hashish with opium). The majority of the street samples were received at the municipal drug centre, brought in by clients of the therapeutic unit, by teachers, parents, and friends, as well as by dealers who had heard of our service. About one-fourth of the investigational material was sent directly to the laboratory at DAPI (Deutsches Arznei Prüfungs Institut), by pharmacists, physicians and undesignated persons.

[1]Max-Planck-Institut für Psychiatrie, Klinisches Institut, 8 München $_{23}$, Kraepelinstrasse $_{10}$, West Germany.

Briefly, thin-layer chromatography, infrared and ultraviolet spectrophotometry were utilized for identification and for purity assessment, while gas chromatographic, spectrophotometric and fluorometric methods were employed for quantitative analysis. To determine very small amounts of LSD, chromatography and fluorometry were used. The laboratory work was done by Dr. Steinigen (1, 2, 3) a pharmacist and chemist with many years of specific experience in pharmaceutical analysis.

RESULTS

The results of qualitative analysis of these samples are summarized in Table I. Among 89 samples declared as LSD, 58 were shown to be pure. Nineteen specimens, especially paper dosage forms and other preparations of large surface (sugar cubes, dextrose tablets, powder capsules and solutions), were often decomposed or contaminated. Of the remaining 12 samples, 11 contained inert materials or harmless compounds (saccharin, dextrose, lactose, urea, potassium sulphate and so on.) The exception was a liquid that was claimed to be pure LSD but consisted of 60 per cent sulphuric acid. (Further dissemination of this solution was prevented.) Among the 14 samples declared as mescaline, only one contained mescaline: this was a capsule filled with 290 mg. of pure mescaline hydrochloride. None of the 6 alleged psilocybin samples was found to contain the drug. A chemical analysis of the alleged mescaline and psilocybin specimens yielded LSD in two instances and in the others inert ingredients such as coloured lactose, starch, dextrose, talcum powder, and dusting powder.

TABLE I

RESULTS OF QUALITATIVE ANALYSIS OF 144 STREET SAMPLES

Alleged Drug	No. of Samples	Pure	Impure	Contained Other Drug Or Inactive Material
LSD	89	58	19	12
Mescaline	14	1	—	13
Psilocybin	6	—	—	6
Amphetamine	12	7	3	2
Heroin	7	—	1	6
Opium	5	5	—	—
Morphine	3	2	—	1
Hashish admixtures	8	7	—	1
Total	144	80	23	41

Among the hashish samples that were claimed to be admixtures with opium, strychnine or belladonna, no such substances were found. Most of these samples were determined to contain relatively high concentrations of tetrahydrocannabinol (THC).

White and greyish-white powders were frequently claimed by drug users to be heroin: one sample was extensively decomposed heroin which could have originated from old stocks. The remaining samples contained lactose, starch, penicillin-G sodium (two instances) and sodium cyanide (one sample).

Among the opium preparations, crude opium and opium extract were found twice each, the latter with a morphine content of about 20 per cent; in one case the material was determined to be an acetic opium tincture (Berlin tincture), which is often sold now as heroin or morphine base or simply called "base". The third sample contained no morphine or opium whatsoever, but consisted of a pulverized analgesic tablet.

The amphetamine ("speed") samples consisting of 5 tablets, 2 ampoules and 5 capsules, were generally pure. There was one instance (an ampoule) of admixture with oxycodone and two others with LSD. Metoclopramide (Paspertin) and the antidepressant amitriptyline were found once each among the remaining samples.

TABLE II

QUANTITATIVE ANALYSIS OF SAMPLES CONTAINING LSD

LSD Content in mcgs.	No. of Samples	%
0 - 50	18	24.7
51 - 150	37	45.2
150 or more	22	30.1
Total	77	100.0

Table II shows the results of the quantitative analysis of the LSD samples studied. The dose range was found to vary between 12 and 244 mcg. of LSD (calculated as base). Samples with LSD concentrations below 50 mcg. were predominantly among the paper "trips" and similar preparations. The higher-dosed samples were mostly of great purity and with few exceptions they were small, white or coloured, well-manufactured tablets.

DISCUSSION

Without wanting to go into detailed comparisons of our results with those reported in the literature, we would nevertheless like to point to some similarities with the results of Marshman and Gibbins (4), the first workers in this field, as well as the findings of Filedt Kok, *et al.* (5) in Amsterdam, and Brown and Malone (6) in California.

As a rule, street samples sold as psilocybin or mescaline are misrepresentations. In the Munich study, most samples analyzed were inert compounds such as coloured lactose, starch, dextrose, talcum and dusting powder – but it seems that LSD is also frequently offered as mescaline or psilocybin in the streets.

Claims of admixtures of LSD with strychnine or amphetamine were not found to have validity in this or in the Marshman study.

Inactive compounds are sold as street drugs quite extensively, with approximately 30 per cent frequency in Munich at the time of our investigation and up to 40 per cent in Amsterdam at about the same time (1971). Brown and Malone, over the period of November 1970 to December 1972, found that only 36 per cent of 717 street samples analyzed contained the alleged drug in relatively pure form.

The Amsterdam group had to intervene three times in the sale of highly toxic substances. The most severe cases in Munich were sales of sodium cyanide as heroin and of 60 per cent sulphuric acid as LSD solution. The sale of phencyclidine (PCP) as LSD, mescaline, THC or other alleged substances is frequently reported by American authors (6,7).

Our Munich survey is too small to permit us to draw conclusions concerning the opiate market. To our knowledge, the most comprehensive study of this market was published by Johnson and Gunn (7), who point to the considerable differences in concentrations of street samples sold as heroin.

The claims of the amount of LSD per sample were extremely unreliable. The dosage in the street is estimated by "biological testing" with the risk of at least a bad trip if not a lifelong psychosis. But therapeutic and prophylactic work in this respect can only be done with valid information on the actual composition of street drugs.

We frequently encountered misinformation concerning the effects of street drugs. Patients have been brought into the drug centre as emergency cases on 'bad trips' which were erroneously attributed to highly exaggerated concentrations of LSD. Similarly, the widespread belief that negative drug experiences are triggered by deteriorated LSD has proven to be untrue. (Considering the minute amounts of active ingredients found in LSD samples, deteriorated products occur in amounts which cannot be considered psychoactive.) However, drug users, as well as drug counsellors and other experts, tend to explain negative drug experiences chemically.

From my experience as a psychiatrist, I would suggest that the service offered by street drug analysis programs has considerable therapeutic impact in our society. In the middle of the confusion and mysticism of the 1970 drug scene in Munich, our program helped in fact-finding and authentic work in the field. The endless discussions concerning whether or not strychnine was in the "black widows" or "green witches" (popular "trips" at that time) could be brought to an end. The important questions concerning the attitudes and motivations of both naïve and experienced users could then be dealt with. For instance, why do we want to believe that it is not LSD which caused us to have a bad trip? Why do we want to try mescaline or psilocybin after a bad acid trip? Why, in short, do we hope that chemistry will explain everything?

Activity in this area, without valid scientific information, is like playing war with placebo bombs, but every once in a while introducing a real one for educational reasons. Or, to give another analogy possibly too drastic and simplistic: in clinical psychiatry considerable work is devoted to physical examinations and biological testing in order to exclude an organic disease underlying the patient's psychopathology. While psychotherapy with a person who has a brain tumour might be indicated, it would be criminally negligent not to have first taken the appropriate diagnostic and therapeutic measures.

Society, however, continues to play these macabre games. It produces vitamin pills, pain pills, tranquillizing pills for 'better living'. Costly epidemiological investigations have produced evidence that one per cent of a representative sample of the German student population is taking mescaline! Most of the epidemiological data that are constantly compiled from the numerous inquiries in schools and universities provide information about drug users' attitudes but not about the actual pattern of use of chemically active substances (8, 9).

CONCLUSION

How should the information coming out of street drug analysis be spread, and indeed should it be spread at all?

In a society where science is used to prove anything; where science is used for mystification of moral and political decisions; where science must be used for legal purposes, science cannot be withheld from the streets. I personally could not undertake an analysis program without giving the information to all who may be concerned.

Withholding such information is, to me, like telling the victims of Hiroshima and Nagasaki they got sick through the machinations of Count Dracula.

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The Amsterdam Program. What now?

J. C. Filedt Kok[1]

The invitation to contribute a paper to the Symposia, presented us at the Wilhelmina Gasthuis in Amsterdam[2] with a problem. Have we obtained sufficient new data since the Congress on Drugs and Alcoholism in September 1972, followed by the extensive publication of our results (1), to justify a further paper? We decided to bring the data up to date and also to enlarge a little on our methods.

Our project commenced in 1970 and ended May 1973. The reason it came to an end was that unfortunately we could not find sufficient time to carry out our regular work in the pharmacy in addition to doing the drug analyses.

We obtained most of our samples through field workers, who bought them from the drug users. The users, in turn, later received the results of our analysis. We have had no difficulties with the police or Justice Department, who knew unofficially what we were doing. We kept the Department of Public Health constantly informed of our results so that the whole investigation took place in an atmosphere of mutual confidence. In fact, we were able to carry out the investigation because the participants and other interested bodies agreed with the sentiment expressed by the Canadian Commission of Inquiry into the Non-medical Use of Drugs, that we have more to fear from wilful ignorance than we do from knowledge in this field. After three years we may say that much ignorance has been dispelled. Our results, and those of the United States and Germany, speak for themselves and it is my impression that we should now turn our attention to the social and clinical implications which are the subject of this symposium.

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[2]The other members of the workgroup on drugs at the Gasthuis are H. J. van der Helm, P. E. Kamp, E.P.J. van der Slooten and R. A. van Welsum.

The results of the qualitative analyses carried out between January 1971 and May 1973 show that there were no important changes during this period. (Table I)

TABLE I

ACTUAL AND ALLEGED DRUG COMPONENTS OF STREET SAMPLES

Actual Drug Component	Alleged Component (N = 854)														
	LSD	Mesc.	Psilo-cybin	DMT	STP	THC	Amph.	Mphen.	PCP	Coc.	Mor.	Cod.	Her.	Opium	Unknown
Number of Samples	279	53	25	1	2	6	283	1	1	25	8	5	36	38	91
Lysergic acid diethylamide (LSD)	189	29	18		1		5								2
Mescaline (Mesc.)		1													
N, N-Dimethyl-tryptamine (DMT)				1											
4-methyl-2, 5-dimethoxy-phenylisoproply-amine (STP)		3													
Amphetamine (Amph.)	7		1				89						2		3
Methamphetamine							101		1				2		7
Methylphenidate (Mphen.)							1								1
Phentermine	1						13								
Cocaine (Coc.)										15					2
Procaine										1					
Morphine (Mor.)											3		5		
Codeine (Cod.)												5			
Heroin (Her.)					1						1		19		1
Noscapine						1	2			3					
Opium														35	1
Phencyclidine (PCP)						3									
Ephedrine							3								
Others	82	20	6			2	69	1		6	4		8	3	74

Of the total 854 samples (hashish excluded) we were unable to identify 19, although a group reaction indicated that there was presumably an active component. In 43 samples we found no indication of any active substance whatever.

The samples offered to us as "unknown" contained a great variety of drugs: amphetamines, sedatives, tranquillizers, and analgesics were regularly found; many samples were over-the-counter preparations.

Both those samples offered as lysergic acid diethylamide (LSD) and those offered as amphetamines contained the alleged substance in 67 per cent of all cases. In about half of the cases the chromatographic identification of LSD gave extra spots with the dimethylaminobenzaldehyde reagent.

Of the sample identified as containing a compound of the amphetamine group, about half were found to contain amphetamine; the other half contained methamphetamine. Amphetamine was sold mostly in tablets; methamphetamine as a crystalline powder.

Samples that were supposedly cocaine actually contained cocaine in 15 of the 25 cases. We found procaine instead of cocaine only once.

In general, we may say that our results do not differ greatly from those in the United States. The more exotic compounds, however, are found much less frequently in Holland than in the U.S.A. For instance, STP (4-methyl-2, 5-dimethoxyphenylisopropylamine) was found only in the beginning; mescaline only once, psilocybin and MDA (3, 4-methylenedioxyphenylisopropylamine) never, phencyclidine (PCP) only a few times — and those within a single week in September 1972. Methaqualone is seldom found in street drug samples although we very often found it in the urine of patients who were intoxicated. Nor did we ever find the combination of LSD and PCP, or of cocaine with other local anaesthetics. If such combinations had existed our methods would certainly have detected them.

Our quantitative results for LSD samples, determined by van der Helm and van der Slooten ranged from 0 to 500 mcg. These are in accord with Mattke's results in Germany, although we have the impression from published data from the United States that the quantities of LSD there generally did not rise above 150 mcg. Unfortunately we have no quantitative results in Holland for the last year.

Of the 36 samples sold as heroin, 19 actually contained diacetylmorphine while 5 others contained morphine. In a study of the ratio between diacetylmorphine and 6-monoacetylmorphine (1) our results were variable, but we have a feeling that we are dealing with no more than three or four brands (1, 2, 3). Since heroin use is increasing in the Netherlands, quantitative analyses would appear to be an important goal for the near future.

Finally, we analysed about one thousand samples of hashish and marihuana. The quantities of tetrahydrocannabinol (THC) and tetrahydrocannabinolic acid (THC-acid) were determined semi-quantitatively. Eskes *et al.* have shown that where hashish is found combined with opium this is not the result of purposeful mixing (1, 4, 5).

In conclusion, we can say that we obtained an impression about the substances that are offered on the black market in Amsterdam. Whether our project has made any contribution to the control of drug abuse is another question.

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A Street Drug Analysis Program – Three Years Later

John K. Brown and Marvin H. Malone[1]

INTRODUCTION

The pioneering publications on the actual composition of illicit drugs (street drugs) by Marshman and Gibbins in 1969 (1) and 1970 (2) soon stimulated others to publish the results of their findings (3-7). These early reports indicated that an amazing amount of deception was taking place in the illicit market (1-10).

During the past three years, researchers in Germany (11), Netherlands (7, 12-15), and the United States (3,6, 8-10, 16-21, 31-42) have contributed to this special area of knowledge. These analytical reports have increased the public's awareness about the uncertain composition of street drugs and also have verified the trend of massive deception originally documented by Marshman and Gibbins. Two of these publications (8, 9) have summarized the analytical data to the end of 1972 from six non-governmental street drug monitoring programs located in various areas of the United States, while the Bureau of Narcotics and Dangerous Drugs (BNDD) of the United States Department of Justice has published the analytical results of 49,000 samples of illicit drugs submitted to their laboratories from July 1969 to June 1971 (21).

During the final months of 1971, the secrecy surrounding street drug analysis programs in California was ended. A newspaper column, "Dr. Hip Pocrates," in the *San Francisco Chronicle* (22) mentioned the Amsterdam street drug analysis project. This was sufficient stimulation for the three existing California groups (University of the Pacific,

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PharmChem Laboratories, Do It Now Foundation) to reveal their programs by writing to Dr. E. Schoenfeld, the author of this column, who subsequently published this information in his weekly commentary (23).

The first issue of the *Pacific Information Service on Street Drugs* was published in November of 1971 and was devoted to summarizing our analytical results regarding alleged mescaline (5). One month later, the Do It Now Foundation of Los Angeles, California published the first of a series of weekly reports on their analytical data in the *Los Angeles Free Press* (24). In January 1972, PharmChem Laboratories of Palo Alto, California began to publish their results in the *PharmChem Newsletter* (25). In April of the same year, Metro Drug Awareness of Minneapolis, Minnesota issued a mimeographed release summarizing the analytical results of illicit drugs in the Minneapolis area. This publication later became the *Metro Drug Awareness Newsletter.* These reports on the actual composition of street drugs had one conclusion in common – the large degree of misrepresentation in the street market. They also showed that alleged single drugs were often mixtures and further that the actual amounts of the active constituents present were generally unknown. Moreover, the idea that these analytical programs would act as a "quality control" mechanism for the dealers in illicit drugs was repudiated. The actual chemistry, as determined by analysis, was generally so different from the alleged chemistry that these results, when made public, tended to destroy the dealers' credibility with their patrons.

METHODS OF COLLECTING SAMPLES

The street drug monitoring programs in the United States depend upon voluntary submission of samples for evaluation. The methods of operation for some of these groups in the United States have been summarized (8). The Amsterdam group does not depend upon voluntary sample submission since they have commissioned people throughout the Netherlands to send in representative samples of currently available illicit drugs (26). This procedure allows for a more accurate evaluation of the status of the illicit market at any given time. The shortcomings of the wholly voluntary submission method may be best explained by the following quotation:

> Before drawing any conclusions about drugs sold on the street, it should be noted that the samples analyzed by PharmChem Laboratories do not necessarily represent a cross section of the street drug trade. People who submit samples to PharmChem are doubtful of the alleged content of the sample. Consequently, we are likely to see a larger percentage of drug deception than actually exists. For example, we rarely receive samples of methaqualone (*eg.*, Quaalude^{R}, Sopor^{R}) even though it is presently a popular street drug. In general, the type of drugs we are most likely to analyze are those which do not originate from legitimate sources such as pharmaceutical manufacturers. (27).

The conclusions drawn in this quotation probably apply to most of the analysis programs in the United States. They do apply to the program at the University of the Pacific.

Each person's reason(s) for submitting a street drug sample for analysis must be documented before he can use the Los Angeles County/University of Southern California (LAC-USC) Medical Center program. Fortunately, these data have been made available from August 1, 1972 to June 30, 1973 (28) and are summarized in Table I. For inter-

pretative reasons, this Table has been divided into two time periods of five months each (August 1, 1972 to December 31, 1972 and January 1, 1973 to June 30, 1973). These data tend to confirm the general observations made by PharmChem Laboratories (27) that the majority (60.8%) of the samples are submitted for analysis because the person: (i) "Doubts Contents" (47%) or (ii) "Doubts Purity" (13.3%). In these cases, one may assume that the analysis was requested prior to use. The other reasons for submission: (iii) "Strong Reaction" (12.0%), (iv) "Light Reaction" (8.7%), (v) "Bad Reaction" (15.0%), and (vi) "No Reaction" (3.5%) would suggest that the drug had been used and that the result was not as anticipated. The increasing frequency of the first two reasons ("Doubt Contents" and "Doubt Purity") in period II (January 1, 1973 to June 30, 1973) would suggest that the analytical results of the street drug analysis programs were becoming more widely known and in particular were thought credible by street drug users.

TABLE I

SUMMARY OF REASONS FOR ANALYSIS REQUESTS BY USERS OF THE LAC-USC MEDICAL CENTER PROGRAM

Reason for Submission	Period I[a] No. (%)	Period II[b] No. (%)	Total (%)
Doubt Contents	143 (42.5)	261 (51.0)	404 (47.5)
Doubt Purity	47 (14.0)	65 (12.7)	112 (13.3)
Strong Reaction	53 (15.8)	48 (9.5)	101 (12.0)
Light Reaction	30 (8.9)	44 (8.6)	74 (8.7)
Bad Reaction	57 (17.0)	70 (13.7)	127 (15.0)
No Reaction	6 (1.8)	23 (4.5)	29 (3.5)
Totals	336(100.0)	511(100.0)	847(100.0)

[a] From August 1 to December 31, 1972.
[b] From January 1 to June 30, 1973.

In 1970, the Canadian Commission of Inquiry into the Non-Medical Use of Drugs (29) recommended the establishment of non-governmental, regional street drug analysis laboratories and also that they should be free from day-to-day interference by governmental authorities. Three years later, the National Commission on Marihuana and Drug Abuse of the United States, recognizing the existence of street drug monitoring programs, recommended:

> Accordingly, the Commission recommends that the government not interfere with private efforts to analyze the quality and quantity of drugs anonymously submitted by street users and to publicize news about market patterns and dangerously contaminated samples. (30)

This would suggest that non-governmental street drug analysis programs are now "respectable" or may soon achieve that status.

ANALYTICAL RESULTS

Three of the four street drug analysis programs summarized here are California based. These programs are: (*i*) University of the Pacific, (*ii*) PharmChem Laboratories of Palo Alto (25, 27, 31-37), and (*iii*) LAC-USC Medical Center of Los Angeles (10, 28). These three programs were selected for two reasons: (*i*) the data were available and reliable, and (*ii*) some of the reported analytical results could be divided into definite time periods. The data from the fourth program, Metro Drug Awareness of Minneapolis, Minnesota (16, 38-42) have been used because they meet the above two criteria and because they represent a geographic area relatively far removed from the others. It has been said with some justification that street drug usage patterns originate in California (43) and that the present status of the illicit market in California can predict the patterns to be seen in other areas of the United States.

Analytical results have been summarized using the alleged content of the individual samples. Results include only those drug samples that could be identified as having been alleged to contain a specific substance (or substances) and cover a period from November 1970 to June 30, 1973. The California data reflect the entire west coast market PharmChem Laboratories does analyses for the University of Oregon (Eugene, Oregon) as well as the San Francisco area. The University of the Pacific screens samples for Western Washington State College in Bellingham, Washington in addition to the Stockton and San Francisco, California areas. The LAC-USC Medical Center program receives the majority of their street-drug samples from southern California, primarily the greater Los Angeles area.

Mescaline (MESC). This compound is one of the active constituents of the peyote cactus [*Lophophora williamsii* (Lem.) Coult.] (44) which has had a long history of use (45). Mescaline is reputed to be a mild psychedelic that is capable of producing colourful hallucinations and altered human consciousness at a dose of approximately 350 mg. (46). Drug experimenters generally consider this state to be pleasant and without danger. Hence, they prefer "mescaline" to lysergic acid diethylamide (LSD). However, natural mescaline is generally unavailable to the dealer and its synthesis is relatively costly and difficult. Consequently, he improvises to meet the demand for this compound. The analytical results of these improvisations are summarized in Table II. Although the usual effective dose of mescaline is widely known in the street market to be 300-400 mg. — single "hits" of "mescaline" screened in our laboratory usually had a total single-dose weight of only 10 to 150 mg.

The results of analyses of 640 alleged mescaline samples (Table II), 581 samples from California, Oregon and Washington (10, 25, 27, 28, 31-37) and 59 from the Minneapolis, Minnesota area (16, 38-42), would suggest that the purchase of genuine mescaline was the rare exception. During the past three years, 581 alleged mescaline samples were analyzed by the three California groups. Of these, 356 samples contained various amounts of LSD only, from a low of approximately 20 mcg. to a high of 450-500 mcg. of LSD per sample (8). Phencyclidine (PCP) was added to 110 LSD-containing, alleged mescaline samples "to smooth out the trip." Other alleged mescaline samples that actually contained LSD sometimes had other compounds added (*e.g.* amphetamine and caffeine) for reasons unknown. Other chemicals identified as alleged mescaline were: amphetamine, cocaine, tetracycline, STP (DOM; 4-methyl-2,5-dimethoxyphenylisopropylamine), and the analgesic-antipyretic acetaminophen. Only 26 samples were identified as containing mescaline and 8 of these samples were identified as originating from the peyote cactus.

TABLE II

SUMMARY OF THE RESULTS OF ANALYSES OF 640 ALLEGED MESCALINE CONTAINING STREET DRUGS

Group Reporting Results	Actual Drug Component(s)					Number of Samples
	MESC	LSD	LSD + PCP	PCP	Not Identified or Other	
Univ. of the Pacific	1[a]	50	4	1	22[b]	78
PharmChem Laboratories	15[c]	95	34	4	10[d]	158
LAC-USC Med. Center	10[e]	211	72	14	38[f]	345
Metro Drug Awareness	–	20	20	8	11	59
Totals	26	376	130	27	81	640

[a]Identified as peyote cactus.
[b]Includes: 2 amphetamine, 1 cocaine, 1 *Cannabis sativa,* 1 LSD + amphetamine, 1 tetracycline, and 16 not identified.
[c]Includes 3 peyote cactus.
[d]Includes: 1 methamphetamine + phenobarbital, 1 LSD + amphetamine, 1 STP and 7 not identified.
[e]Includes 4 peyote cactus.
[f]Includes: 2 LSD + amphetamine, 2 STP, 1 LSD + caffeine, 1 LSD + methamphetamine, 2 acetaminophen, and 30 not identified.

Lysergic Acid Diethylamide (LSD). The "Summer of Love" of 1967 in the Haight-Ashbury area of San Francisco soon became the "Autumn of Deception." The "pure acid" was adulterated with amphetamine, "Pink Wedge" was LSD plus STP (47) and the strengths were misrepresented (4, 6). Twelve capsules and tablets were alleged to contain 250 mcg. of LSD per dose; analysis of these indicated that one had no LSD while the others contained 2, 7, or 26 mcg. of LSD per dosage form (6). The illicit market was even then beginning to resemble the regular market place. The street market clearly had adopted the "establishment" motto, *caveat emptor.*

The illicit LSD market has changed very little since 1967. The analytical results of 581 alleged LSD-containing street drugs are tabulated in Table III. Of these, 509 are from the West Coast area (10, 25, 27, 28, 31-37) and 72 from the Minneapolis, Minnesota area (16, 38-42). The findings of each group are similar; most samples contained varying amounts of LSD and occasionally phencyclidine was detected in addition to LSD.

LSD is available on the street market in numerous dosage forms: various colored powders in capsules, a spot on paper ("Blotter Acid"), or in gelatin flakes ("Window Pane", "Clearlight"), but most frequently in the form of a colored tablet triturate – each color supposedly representing some degree of "purity and potency." Orange tablet triturates, known as "Orange Sunshine," are considered by some to be the ultimate in purity and accuracy of dosage. PharmChem Laboratories has reported the LSD content of an "Orange Sunshine" tablet triturate as 475 mcg. (31). Do It Now Foundation, in 1972, published the amount of LSD found in four "Orange Sunshine" samples as 145, 200,

240, and 258 mcg. per tablet (48). We at the University of the Pacific, have estimated the LSD content of three "Orange Sunshine" samples to be 200-500 mcg. (49). Three samples of "Red Sunshine" were reported by PharmChem Laboratories to have an LSD content of 126, 225, and 450 mcg. respectively (31-32). The gelatin flakes ("Window Pane") have been reported to contain 150-250 mcg. of LSD (48-49).

TABLE III

SUMMARY OF THE RESULTS OF ANALYSES OF 581 ALLEGED LYSERGIC ACID DIETHYLAMIDE (LSD) CONTAINING STREET DRUGS

Group Reporting Results	Actual Drug Component(s)				Number of Samples
	LSD	LSD + PCP	Other	Not Identified	
Univ. of the Pacific	68	1	3[a]	8	80
PharmChem Laboratories	172	5	6[b]	3	186
LAC-USC Med. Center	212	10	9[c]	12	243
Metro Drug Awareness	39	15	11[d]	7	72
Totals	491	31	29	30	581

[a]Includes: 1 LSD + amphetamine, 1 secobarbital + amobarbital, 1 clindamycin hydrochloride (Cleocin HCl).
[b]Includes: 3 LSD + amphetamine, 1 LSD + methamphetamine, 1 phencyclidine (PCP), 1 STP.
[c]Includes: 1 PCP, 1 hashish, 2 caffeine, 1 calcium carbonate, 1 amphetamine, 1 STP, 1 methapyrilene (Histadyl), 1 benztropine mesylate (Cogentin).
[d]Includes: 9 PCP, 1 caffeine, and 1 methamphetamine.

James and Bhatt wrote the following about illicit LSD in 1972 (19):

> The much publicized poison strychnine was detected in only a single sample. This was much less frequent than anticipated. Strychnine is allegedly added to LSD in small doses for its stimulating effect but cramps, convulsions, and coma have occurred from ingestion of LSD heavily laced with this drug. Dr. William Abruzzi has reportedly treated numerous cases of strychnine poisoning at the Woodstock Music Festival in 1969 and the Powder Ridge Music Festival in 1970.

The allegations that LSD samples frequently contain strychnine (19, 49) appears to be unfounded. We have analyzed three LSD samples thought to contain strychnine on the basis of toxic symptoms; in each case only LSD was detected. However, the amounts of LSD in each of these samples was excessive – estimated to be between 300 and 500 mcg. (49). None of the groups doing street drug analysis on a regular basis has reported finding strychnine in any LSD-containing sample. The answer appears to be that large doses of LSD tend to mimic the symptoms of strychnine poisoning (49).

Johnson and Gunn (21) of the United States Bureau of Narcotics and Dangerous Drugs reported finding only one LSD sample adulterated with strychnine although the BNDD routinely checks all LSD samples for this compound (21). The origin of this sample was not given nor were the amounts of each ingredient reported. The proof that strychnine may be an intentional adulterant of some LSD dosage forms is still equivocal.

Psilocybin (PSI). The use of the "Magic Mushroom," *Psilocybe mexicana* Heim (51) by Mexican Indians and sensational reports on this practice in the popular press have created a real market for the compound psilocybin. This compound is also found in other species of *Psilocybe*, as well as in certain *Conocybe* and *Stropharia* mushrooms (51). Recently, even alleged psilocybin-containing mushrooms have been offered in the illicit market place. The analytical results (10, 16, 25, 27, 28, 31-42) of 284 alleged psilocybin-containing samples are summarized in Table IV. The results show that pure psilocybin is not available on the street. The majority of these samples (62%) contained LSD only while 11.3 per cent contained a mixture of LSD and phencyclidine (PCP). Ten psilocybin-containing mushrooms were identified by two California groups (PharmChem, LAC-USC). In our experience, three alleged psilocybin-containing mushrooms relied on the addition of LSD for activity. The remaining alleged psilocybin-containing samples were either not identified or contained one or more pharmacologically active compounds other than psilocybin or LSD (Table IV).

TABLE IV

SUMMARY OF THE RESULTS OF ANALYSES OF 284 ALLEGED PSILOCYBIN (PSI) CONTAINING STREET DRUGS

Group Reporting Results	Actual Drug Component(s)					Number of Samples
	PSI	LSD	LSD + PCP	Other	Not Identified	
Univ. of the Pacific	—	5	1	—	2	8
PharmChem Laboratories	4[a]	84	9	7[b]	12	116
LAC-USC Med. Center	6[a]	82	10	3[c]	17	118
Metro Drug Awareness	—	13	12	12[d]	5	42
Totals	10	184	32	22	36	284

[a]Identified as psilocybin-containing mushrooms.
[b]Includes: 3 PCP, 1 STP, 1 LSD + PCP + amphetamine, 1 LSD + amphetamine, 1 ergot alkaloids.
[c]Includes: 1 PCP, 1 mescaline, 1 DMT + amphetamine.
[d]Consists of 12 PCP.

Tetrahydrocannabinol (THC). Allegedly pure THC, the quintessence of *Cannabis sativa* L., continues to be offered by the "reliable street drug dealer." However, this compound, in a pure form, is not available on the United States street market. The

analytical results (10, 16, 25, 27, 31-42) of 149 alleged THC-containing street drugs are summarized in Table V. The five samples identified as THC were actually concentrated extracts from *C. sativa* known as "Hash Oil" and were reported to contain approximately 9 to 40 per cent THC (27) – very potent preparations. The most frequently identified compound in alleged THC samples was the tranquillizer-anaesthetic phencyclidine; 115 samples (77%) relied on PCP for the active ingredient. The ubiquitous LSD was detected in 9 more alleged THC samples. Other pharmacologically active compounds (Table V) were also identified in illicit "THC" samples.

TABLE V

SUMMARY OF THE RESULTS OF ANALYSES OF 149 ALLEGED TETRAHYDROCANNABINOL (THC) CONTAINING STREET DRUGS

Group Reporting Results	Actual Drug Component(s)				Number of Samples
	THC	PCP	Other	Not Identified	
Univ. of the Pacific	–	14	1[a]	4	19
PharmChem Laboratories	5[b]	32	1[c]	1	39
LAC-USC Med. Center	–	44	15[d]	2	61
Metro Drug Awareness	–	25	4[e]	1	30
Totals	5	115	21	8	149

[a]Identified as chlordiazepoxide (Librium).
[b]Not synthetic THC but concentrated ("Hash Oil") extracts of *Cannabis sativa* containing approximately 9 to 40% THC (27).
[c]Identified as LSD.
[d]Includes: 3 LSD + PCP, 4 local anaesthetics, 5 TCP, a thionyl analogue of PCP (28), 1 PCP + doxepin hydrochloride (Sinequan), 1 LSD, and 1 MDM (3, 4-methylenedioxymethamphetamine).
[e]Identified as 4 LSD.

Marihuana (Cannabis sativa L.). The marihuana samples submitted to us for identification and evaluation were frequently alleged to have been treated with some chemical such as phencyclidine (PCP). PharmChem Laboratories reported that similar reasons were given by the persons sending marihuana samples to their laboratory (25, 34).

The analytical results of 303 alleged marihuana samples (University of the Pacific 40, LAC-USC Medical Center 153, PharmChem Laboratories 40, and Metro Drug Awareness 70) are available in the literature (10, 16, 25, 27, 31-42). One sample was *Cannabis sativa* treated with N, N-dimethyltryptamine (DMT) (35), two samples were identified as parsley (*Petroselinum* sp.) treated with PCP (17), 10 samples were *Cannabis sativa* with added PCP (2 from California and 8 in Minneapolis), 15 samples contained no drug and the remaining 275 samples were identified as *Cannabis sativa* with varying amounts of THC and no psychoactive compounds other than the cannabinoids were detected.

Hashish. Alleged hashish, including "Hash Oil", is submitted infrequently for analysis. As was suggested a year ago (8) there are two possible explanations for this observation: (*i*) that this material is not readily available on the United States street drug market or (*ii*) that it is available, but rarely causes unexpected reactions in the user.

During the past three years, the University of the Pacific group has evaluated 10 alleged hashish samples, including two alleged "Hash Oil" submissions. Eight of these samples were identified as having been derived from *Cannabis sativa*; the other two samples were not identified. PharmChem Laboratories (27, 34, 35, 37) has reported on six alleged hashish samples during the past two years; all were identified as derivatives of *Cannabis sativa*. LAC-USC Medical Center (28) has reported the analytical results of 19 alleged hashish samples submitted to their laboratory; 18 were identified as having been derived from *Cannabis sativa* and one sample was not identified. During 1972 and the first six months of 1973, Metro Drug Awareness (16, 37-42) reported on nine alleged hashish samples; five were reported as being derived from *Cannabis sativa* and four samples were not identified.

Amphetamine (AMP). This drug appears to be readily available in the street drug market. One of the more frequently encountered dosage forms is a small, flat, compressed tablet with a crossed score (known as "White Crosses" or "Mini Bennies") and usually weighing approximately 50 mg. Quantitative results on this dosage form have been published with the amount of amphetamine in each tablet reported to vary from a low of 2.5 mg. to a high of 10 mg. (48).

TABLE VI

SUMMARY OF THE RESULTS OF ANALYSES OF 300 ALLEGED AMPHETAMINE (AMP) CONTAINING STREET DRUGS

Group Reporting Results	Actual Chemistry				Number of Samples
	AMP	AMP + BARB	Other	Not Identified	
Univ. of the Pacific	31[a]	1	5[b]	5	42
PharmChem Laboratories	34[c]	—	6[d]	1	41
LAC-USC Med. Center	62	5	24[e]	11	102
Metro Drug Awareness	68	—	40[f]	7	115
Totals	195	6	75	24	300

[a] This includes 29 samples of "White Crosses".
[b] Includes: 1 caffeine, 1 phenobarbital, 1 pentobarbital, 1 sodium chloride, 1 phentermine (Ionamine).
[c] Includes 2 methamphetamine.
[d] Consists of 1 LSD, 1 barbiturate, 1 chlorpheniramine.
[e] Consists of 1 AMP + strychnine, 1 propoxyphene (Darvon) + strychnine, 1 barbiturate, 1 secobarbital, 1 local anaesthetic, 5 ephedrine, 1 tetracycline, 1 prednisone, 1 aminophylline, 2 phendimetrazine (Plegine), 1 diazepam (Valium), 1 AMP + salicylic acid, 3 phenylpropanolamine, 1 cocaine + procaine, 1 MDA.
[f] Identified as 36 caffeine, 3 ephedrine + caffeine, and 1 lactose.

The analytical results (10, 16, 25, 27, 31-42) of 300 alleged amphetamine samples are summarized in Table VI. The results indicate that amphetamine was frequently (64%) the only compound detected and that occasionally the amphetamine was accompanied by a barbiturate. Strychnine was detected in two samples (28): one mixed with amphetamine, and the other mixed with propoxyphene (Darvon). Sixty-five samples contained a wide variety of non-amphetamine drugs such as caffeine, barbiturates, ephedrine, and local anaesthetics, while in 24 samples no drug was detected.

Cocaine. This compound has a long history of non-medical use both in the Americas (52, 53) and Europe (53, 54). Recently this drug has become more widely available on the illicit markets of the United States (8, 9, 21, 54). In September of 1972, we reported the analytical results of 38 alleged cocaine samples (8), in January 1973 we were able to report the analytical findings on 60 alleged cocaine samples (9), and by May of 1973 the number of reports had risen to 295 (54).

The analytical results (10, 16, 27, 28, 31-42) of 361 alleged cocaine-containing samples are summarized in Table VII. Cocaine, in various amounts, was the only compound detected in 197 samples. Cocaine plus some local anaesthetic, such as procaine, was detected in 83 samples. The non-cocaine containing samples were frequently identified as a local anaesthetic such as procaine, lidocaine or benzocaine. Heroin either alone or mixed with some other drug was identified in 4 alleged cocaine samples. The contents of 20 samples were not identified.

TABLE VII

SUMMARY OF THE RESULTS OF ANALYSES OF 361 ALLEGED COCAINE CONTAINING STREET DRUGS

Group Reporting Results	Actual Drug Component(s)				Number of Samples
	Cocaine	Cocaine + Local Anaesthetics	Other	Not Identified	
Univ. of the Pacific	10	6[a]	5[b]	5	26
PharmChem Laboratories	103	42[c]	14[d]	9	168
LAC-USC Med. Center	73	34	33[e]	4	144
Metro Drug Awareness	11	1	8[f]	3	23
Totals	197	83	60	21	361

[a]Consists of: 4 cocaine + procaine, 1 cocaine + procaine + benzocaine, 1 cocaine + procaine + butacaine.
[b]Identified as 1 heroin + amphetamine, 2 procaine, 1 PCP, 1 "soap."
[c]Consists of: 20 cocaine + procaine, 13 cocaine + lidocaine, 2 cocaine + benzocaine, 4 cocaine + procaine + lidocaine, 2 cocaine + benzocaine + lidocaine, 1 cocaine + local anaesthetic.
[d]Identified as 1 cocaine + PCP, 2 benzocaine, 3 procaine, 4 lidocaine, 1 cocaine + PCP + LSD, 3 amphetamine.
[e]Consists of 14 local anaesthetics, 2 amphetamine, 2 heroin, 4 PCP, 1 saccharin, 1 tyramine, 1 heroin + caffeine, 2 barbiturates, 1 LSD, 1 caffeine, 1 potassium nitrate, 1 coca leaves, 1 cocaine + codeine, 1 inorganic sulfate, 1 methapyrilene + caffeine + salicylamide.
[f]Identified as 2 procaine and 6 lidocaine.

MDA (3,4-methylenedioxyphenylisopropylamine). Occasionally, this compound, which is about three times as active as mescaline (46), is submitted to street drug analysis programs for identification. The first alleged MDA samples were submitted to the University of the Pacific this year (1973). We have had three alleged MDA samples; one was a mixture of MDA and amphetamine and no psychoactive drugs were detected in the other two samples. PharmChem Laboratories reported (27, 31-37) the analytical results of 25 alleged MDA samples. Twenty-one actually contained MDA, one had LSD only, and three samples were identified as STP. During the past two years, LAC-USC Medical Center has reported (10, 28) the analytical results of 27 alleged MDA-containing samples as follows: 15 MDA, three PCP, four LSD, one LSD + PCP, one local anaesthetic, one amphetamine, and one sample containing no drug. Metro Drug Awareness during the past 15 months has reported (16, 42) on 11 alleged MDA samples: eight MDA, one LSD, and no drug was detected in two samples.

Barbiturates. The barbiturates comprise a group of drugs known as "Downers" and are further subdivided on the basis of alleged content. "Reds," "Mexican Reds" and "F-40's" are alleged secobarbital formulations. Alleged pentobarbital-containing street drugs are commonly referred to as "Yellows" or "Nembies."

During the past three years, the University of the Pacific has screened 35 alleged barbiturate-containing samples. Seventeen of these samples were alleged to be "Reds"; of these, 14 were identified as containing various concentrations of secobarbital only and three samples consisted of a mixture of secobarbital and amobarbital. Four samples were alleged to be "Yellows" and each contained various amounts of pentobarbital only. The other 14 samples were alleged "Downers" and were identified as follows: 10 contained a barbiturate (usually phenobarbital), one diphenylhydantoin (Dilantin), one secobarbital plus amobarbital, two doxepin (Sinequan). The results reported by PharmChem Laboratories (27, 31, 35-37) and LAC-USC Medical Center (10, 28) were similar to our findings.

Opiates. Included in this category are opium, opium poppy capsule (*Papaver somniferum* Linne), codeine, morphine, diacetylmorphine (heroin), hydromorphone hydrochloride (Dilaudid), and methadone.

The numbers of samples of opiates submitted to street drug analysis programs during the past three years, have been relatively small: University of the Pacific, 14 samples; PharmChem Laboratories, 10 samples; LAC-USC Medical Center, 34 samples; and Metro Drug Awareness, 20 samples.

Of the 14 alleged opiate samples submitted to the University of the Pacific, only 8 were alleged to be heroin. The analytical results were: two heroin, one heroin + procaine, one codeine, one aspirin + phenacetin + caffeine + codeine, one secobarbital, and one without an active ingredient. One alleged morphine sample was determined to be saccharin. Two alleged methadone-containing solutions actually contained methadone; an alleged hydromorphone hydrochloride (Dilaudid) sample contained no detectable drug. Two alleged opium poppy capsules were investigated and morphine was detected in each case.

PharmChem Laboratories has reported (27, 32, 35-37) on 17 alleged opiate-containing samples. Of the 10 alleged heroin samples, three were heroin, one heroin + morphine + procaine, one heroin + procaine, one heroin + procaine + cocaine, one heroin + methadone, one heroin + procaine + phenobarbital, one lidocaine, one morphine, and no drug was detected in one sample. Five samples were submitted as opium and reported as two hashish (*Cannabis sativa*), and three opium. One alleged morphine-containing sample contained morphine and the other was identified as methylphenidate (Ritalin).

The LAC-USC Medical Center group has reported (10, 28) on 34 alleged opiate samples during the past two years. Sixteen samples alleged to be opium were identified as: 6 opium, one heroin, 4 *Cannabis sativa*, one codeine, one morphine, and no drug detected in three samples. The 16 samples alleged to be heroin consisted of: three heroin, four heroin + procaine, one pentazocine (Talwin), two local anaesthetics, one pyrilamine + salicylamide + phenacetin, one sugar, and no drug was detected in 4 samples. Two alleged morphine samples were identified as lidocaine and noradrenalin, respectively.

Metro Drug Awareness has reported (16) the results of the analysis of 20 alleged opiate-containing samples. Heroin was the alleged active constituent 11 times; however, the results indicated: three heroin, one caffeine, and no detectable drug in 7 samples. Eight alleged opium samples were evaluated; none contained any of the opium alkaloids and they also were devoid of any other detectable drugs. The one alleged morphine sample was identified as morphine.

DISCUSSION

Three years and 2,315 street drug analyses later, the trend of large scale misrepresentation of street drugs, indicated by Marshman and Gibbins in 1969 (1) and 1970 (2), has been verified. In only 919 (approximately 40%) of 2,315 samples was the alleged material actually present. Even then the amounts present varied widely. When the analytical results of 6 different street drugs (mescaline, LSD, psilocybin, THC, amphetamine, and cocaine) are considered separately, the degree of misrepresentation varies widely. Only 4.5 per cent of alleged mescaline samples contained any mescaline as compared to the alleged LSD samples where 85 per cent had various amounts of this compound only. Only 3.5 per cent of alleged psilocybin submissions contained some psilocybin; and of the alleged THC submissions, no authentic material was found whatsoever. Sixty-five per cent of the alleged amphetamine samples contained various amounts of either amphetamine or methamphetamine; and 55 per cent of the alleged cocaine samples contained varying amounts of cocaine as the only active ingredient.

Mescaline (MESC). Mescaline (Table II) is generally not available in the street market. Approximately 79 per cent of the illicit "mescaline" relied on LSD or LSD with phencyclidine to provide the user with a "state of altered consciousness", even though the synthesis of mescaline from common starting materials has been published in the literature (56). Malone (49) has made a valid and reasonable proposal, based on economics, why LSD is the compound preferred by the producers of street "mescaline."

> LSD is relatively easy to make if one starts with certain of the expensive ergot alkaloids (a semisynthetic process). Mescaline is somewhat more difficult to make, but the starting materials are relatively cheap. However, one level teaspoonful of mescaline (assume that it weighs equivalent to table salt) represents 16 doses while the same weight of LSD represents 192,000 safe doses if formulated properly. Assuming that each dose could be sold for a minimum of 50¢ (cheap), the teaspoonful of mescaline could sell for $8.00 as contrasted to $96,000.00 for the same amount of LSD. Once you deduct the cost of the starting material, the mescaline manufacturer is losing money even if he sells direct. The LSD manufacturer is a businessman first and foremost. Altruism has never been a characteristic of street drug manufacturers or peddlers. (49)

Lysergic Acid Diethylamide (LSD). This compound is readily available (Table III) on the street market but the amount of LSD per sample may vary from zero to 500 mcg.

(31, 48, 49). Evidence that strychnine-like poisonings have resulted from ingestion of LSD formulations is real, but the analytical detection of strychnine in street formulations of LSD is extremely rare. A sample of purple powder submitted to our laboratory belonging to a user hospitalized with "strychnine" poisoning, contained LSD only in a very high concentration. It was estimated that the person had ingested in excess of 400 mcg. (49). Excessive doses of LSD tend to pr(duce symptoms very similar to strychnine poisoning (49).

Psilocybin (PSI). This widely popularized substance is non-existent on the illicit market as a pure compound (Table IV). The usual psychoactive agent detected in "psilocybin" samples is LSD approximately 72 per cent of the time. The reason for this is probably similar to that given to account for the substitution of LSD for mescaline (49). Occasionally psilocybin-containing mushrooms have been submitted to street drug analysis programs but usually the mushrooms have had LSD added to them and are not psilocybin-containing.

Tetrahydrocannabinol (THC). This agent, as the pure compound, has never been identified (Table V) in a street drug sample submitted for analysis. Phencyclidine was identified as the active constituent in approximately 77 per cent (115 of 149 samples) of the alleged THC samples discussed here. PCP is usually classified as an animal tranquillizer but at increased dosage it has hallucinatory and anaesthetic properties (57). Recently LAC-USC Medical Center has reported a case of PCP poisoning (58). It was determined that the patient had ingested approximately 180 mg. of phencyclidine, resulting in a comatose condition for three days, with recovery on the fourth day. Only 0.04 mg. of PCP per 100 ml. of urine was detected in the first urine sample and no PCP was detectable in urine samples collected on the second and third days. Treatment was not reported in this instance.

Marihuana and Hashish. Marihuana, in our experience, was only submitted for evaluation because of some adverse or unexpected reactions *after use*. The allegations that many of these samples were contaminated with some drug such as PCP generally were incorrect. According to available data marihuana samples were usually, as alleged, derived from *Cannabis sativa* (approximately 90%) and not adulterated with some other drug. Usually the samples thought to be contaminated with PCP had a very high THC content (14, 17, 59). The relatively few hashish samples submitted to the 4 street drug analysis groups have been identified as derivatives of *Cannabis sativa* in 83 per cent of the cases.

Amphetamine (AMP). The quality of street-amphetamine has decreased. A survey to June 30, 1972 of the analytical results of alleged amphetamine street drugs indicated that approximately 75 per cent of these samples contained various amounts of amphetamine or methamphetamine as the only active ingredient (8). The current summary (Table VI) shows that the percentage now has dropped to approximately 65 per cent, a decrease of 10 per cent. This increase in misrepresentation may be due to decreased availability of "White Crosses" on the street market. These tablets were usually reliable as to content although the amount of amphetamine per tablet tended to vary widely (48). Strychnine was identified in two alleged amphetamine samples (28) — the result of a "self-fulfilling prophecy?"

Cocaine. This compound is probably one of the most expensive drugs on the illicit market since it is the current "high status" drug. The going market price for cocaine is $950 to $1,500 per ounce or $50 to $60 per gram (27, 37, 38). These are the prices regardless whether the product is 100 per cent pure cocaine, 6 per cent pure cocaine, 34 per cent cocaine with 4 per cent lidocaine, or 100 per cent amphetamine (27, 37). This

high selling price for illicit cocaine probably is the major incentive for the dealer to reduce the amount of cocaine in a sample, to adulterate with a local anaesthetic, or to sell some other drug as cocaine. Approximately 55 per cent of the alleged cocaine samples analyzed (Table VII) contained various amounts of cocaine only, approximately 22 per cent were cocaine mixed with a local anaesthetic, while the remaining 23 per cent either contained some other drug (most frequently a local anaesthetic) or no drug at all. The frequent use of local anaesthetics as an adulterant of cocaine or as a substitute for this compound may be explained on the basis of the buyer's quality control "taste test." If it numbs the tongue, then it must be cocaine. The toxicity of these mixtures is probably minimal if inhalation is the route of administration but can be serious if injected (55). The other compounds or mixtures alleged to be cocaine (Table VII) would suggest that the person or persons preparing these mixtures have considerable imagination but no honour. Once again the supplier of illicit drugs is "maximizing" profits at the expense of the naïve consumer.

MDA (3,4-methylenedioxyphenylisopropylamine). This compound has been considered a street drug at least since 1967 (60) and it is periodically submitted to street drug analysis programs for evaluation. Most frequently, these samples (44 of 63) contained MDA only. There is a paucity of human toxicological knowledge about this drug, but apparently there are hazards involved in its use as a hallucinogen. Richards and Borgstedt (61) reported on the hospitalization of three individuals, an almost fatal result for one after the ingestion of approximately 500 mg. of pure MDA. Interestingly, the initial diagnosis was strychnine poisoning based on the observed symptoms. Subsequent analysis of the drug (supplied by the patients) indicated chemically pure MDA with no strychnine or other adulterants. Meyers *et al.* (60) reported the death of one person associated with the use of MDA and in combination with another drug. No details concerning either the dose of MDA or the other drug involved were reported. The ultimate cause of death was also not reported. Apparently this drug has a real potential for toxicological problems if it becomes more popular and available on the street.

Barbiturates. The experience in our laboratory and in other laboratories has been that alleged barbiturates usually contain a barbiturate, frequently secobarbital (21, 62, 63). The degree of misrepresentation as to content of illicit barbiturates is rather small, but the wide variability in the amount of drug in each dose presents a serious health hazard. The amount of secobarbital per capsule of illicit "Reds" has been reported based on 1,000 doses seized in 22 different cases (63). The content was determined to range from a low of 21 mg. to a high of 113 mg. of secobarbital per capsule. The capsules were all the same size and filled with about the same amount of powder. These wide differences in secobarbital content may represent after ingestion ". . .the difference between *conscious* sedation and *unconscious* 'sleep', a critical difference for those who drive cars. . ." (62)

Heroin. Marihuana is the only illicit material that is seen more frequently in the laboratories of the U.S. Bureau of Narcotics and Dangerous Drugs than heroin (21), yet heroin is seldom seen in the street drug analysis programs. During the past three years the four street drug analysis programs discussed here have reported on only 45 alleged heroin samples. Apparently, heroin users do not use these programs and possibly for the following reasons. First, the heroin user must expend a great amount of time and energy to obtain sufficient money to buy street heroin on a regular and continuing basis. Thus he is unwilling to part with any of the drug for analysis. The amount of energy required is suggested by the following quotation (64):

> Below the 'fat cats' are the junkies – bloodsucked dry by the frenzied hustle to procure heroin by dealing, stealing, or 'turning tricks' until they reach the economic ceiling (about $200 per day).

Secondly, the heroin user views his "drug of choice" as anything he buys from his connection and seems not to be interested in the actual contents. This attitude is suggested by the street terms for heroin and the user's approach to his lifestyle.

> The heroin user becomes an addict when he is motivated by a 'total need for heroin.' In street-language he is 'strung out' and will do almost anything to obtain his drug. The product he buys on the street is referred to as a 'bag' or 'balloon' depending on how it is packaged: (*i*) a glassine bag; or, (*ii*) a rubber balloon. Its contents may be called 'junk', 'shit', or 'smack'. (65)

CONCLUSIONS

The determination of the actual chemistry of street drugs, the rapid publication of the results, and the subsequent compilation and correlation of these results in summaries have several important benefits for society. Undoubtedly, the most important use of these data is to make the user or potential user aware of the real hazards involved in ingesting the "drugs" obtained on the illicit market.

Secondly, the availability of data reporting the alleged contents and the actual chemistry of illicit drugs to treatment centres, allows the physician to make a more accurate assumption as to the correct identity of the ingested material and aids him in prescribing treatment for adverse street drug reactions (66). One example of this use can be illustrated by the experience one of us (JKB) had when presenting a talk on the "Actual Composition of Street-Drugs" to a San Francisco area psychiatric group. Afterwards a psychiatrist commented that a patient under treatment for the ingestion of "mescaline" exhibited symptoms which he realized at the time were not characteristic of a mescaline overdose. He added "now I know it must have been LSD."

The trends in popularity of the various psychedelics can be determined by evaluating the number of submitted samples (as alleged) during discrete periods of time. As an example of this, the data from two California-based programs (University of the Pacific, LAC-USC Medical Center) have been selected and evaluated statistically to see if there have been changes in patterns of drug use (Figure 1). The total numbers of submitted samples were divided between two time periods: November 1, 1970 – July 31, 1972 and August 1, 1972 – June 30, 1973. These periods were selected for two reasons: (i) the number of samples submitted each month were relatively constant and (ii) the total number of samples submitted for these two periods were approximately the same. Using Chi^2 analysis, there was a very highly significant ($p = <0.001$) decrease in the relative number of alleged mescaline samples submitted to the two California programs during Period II as compared to Period I. Balancing these statistics, there was a significant ($p = <0.025$) increase in the relative number of LSD submissions. There was no significant change in the relative number of alleged psilocybin ($p = >0.30$) and alleged tetrahydrocannabinol ($p = >0.50$) submissions during these two periods. During the past three years, amphetamine samples submitted for analysis show a highly significant ($p = <0.001$) increase in Period II when compared to Period I. The very highly significant increase ($p = <0.001$) in the relative number of alleged cocaine samples submitted during Period II would indicate a large increase in the illicit use of this drug.

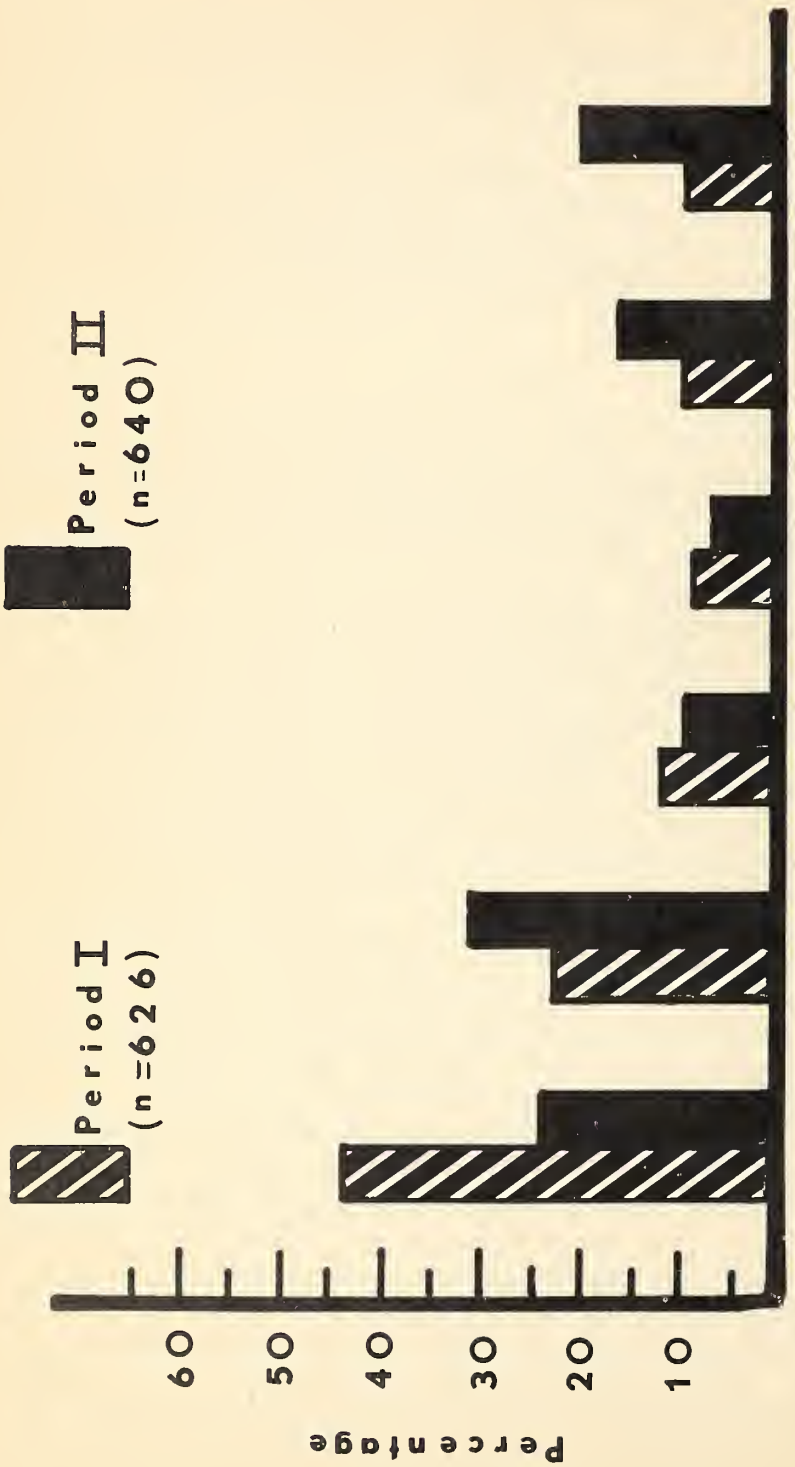

Figure 1. *Comparison of per cent submissions of alleged mescaline (MESC), lysergic acid diethylamide (LSD), psilocybin (PSI), tetrahydrocannabinol (THC), amphetamines (AMP), and cocaine (COCA) in period I (Nov. 1, 1970 – July 31, 1972) relative to period II (Aug. 1, 1972 – June 30, 1973). Actual numbers of samples (I/II) are: MESC, 271/152; LSD, 140/183; PSI, 68/58; THC, 42/38; AMP, 52/92; COCA, 53/117.*

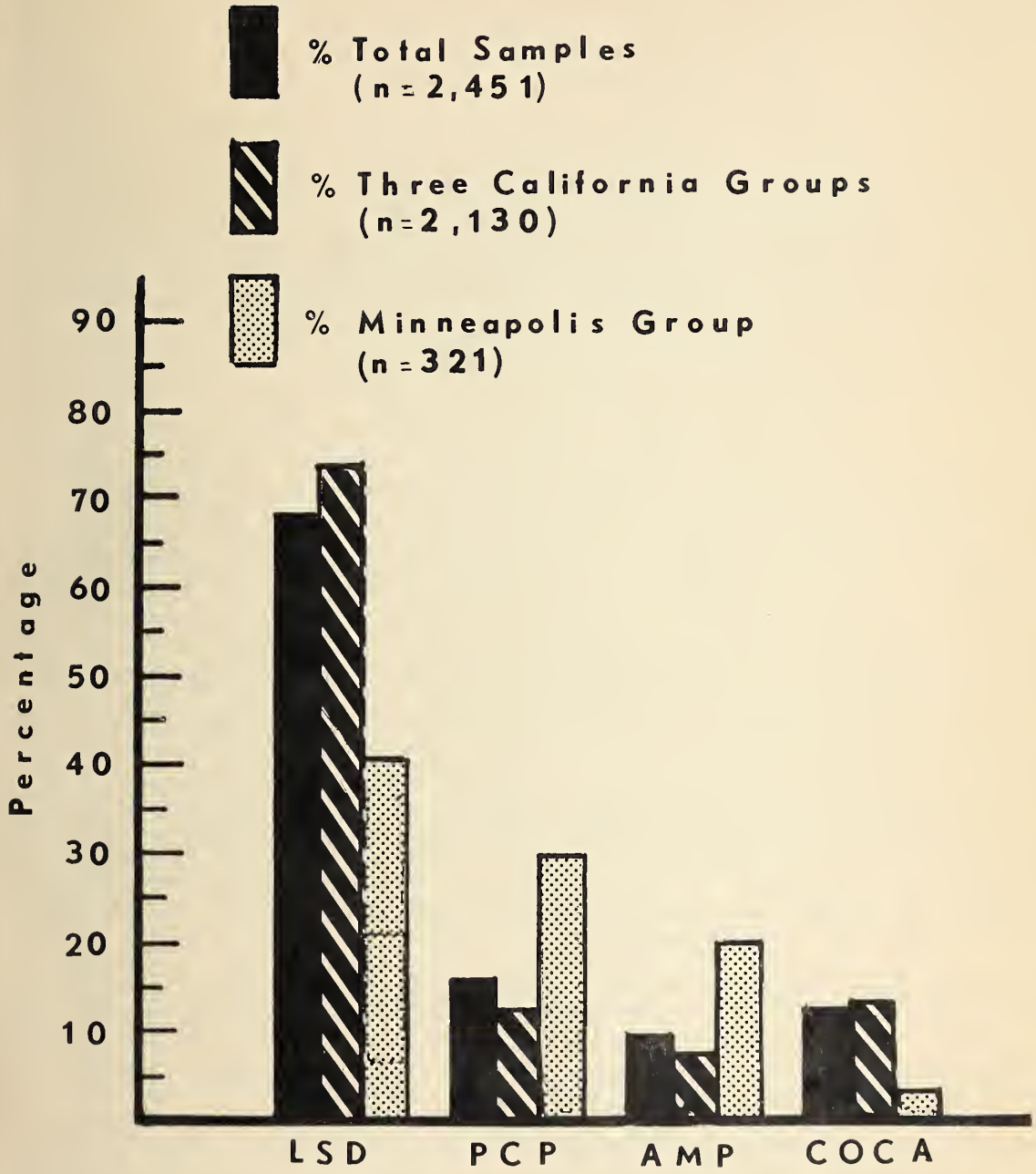

Figure 2. *Comparison of per cent detection of actual lysergic acid diethylamide (LSD), phencyclidine (PCP), amphetamines (AMP), and cocaine (COCA) in California relative to detection in the Minneapolis, Minnesota area. Actual numbers of samples (Total/California/Minneapolis) are: LSD (1584/1445/139); PCP (356/255/101); AMP (226/157/69), and COCA (285/273/12).*

The data concerning the *actual* composition of illicit drugs is also useful for determining the frequency of occurrence of various drugs in all the samples analyzed. These data can be useful in indicating (predicting) changes in the actual availability of certain illicit drugs and also the real patterns of drug use relative to different geographical areas. The percentage of samples (Tables II-VII) that were found to contain lysergic acid diethylamide, phencyclidine, amphetamines, or cocaine, either alone or in combination with these or other drugs is shown in Figure 2. Lysergic acid diethylamide was reported to be a constituent of 68 per cent of those street drugs summarized in Tables II-VII. This would suggest that lysergic acid diethylamide is the compound most readily available to the illicit drug dealers, and the compound is used to give "activity" to alleged mescaline-(Table II) and psilocybin-containing (Table IV) street drugs. When these data were divided into two groups, one for California and the other for the Minneapolis area, it was apparent that there was a large difference in the frequency of lysergic acid diethylamide in these areas, *i.e.* lysergic acid diethylamide was detected in 73.5 per cent of the street drugs analyzed (Tables II-VII) by the three California groups and in only 40.7 per cent of the illicit samples analyzed by the Minneapolis group. Lysergic acid diethylamide would appear to be truly less available ($p = <0.001$) in this area than in California. If we assume that California patterns are predictive, then we may assume that lysergic acid diethylamide availability may sharply increase in the Minneapolis area within the next few years.

Phencyclidine was detected in 15.4 per cent of all samples analyzed (Tables II-VII); it was most frequently found in alleged tetrahydrocannabinol samples and reputedly added to lysergic acid diethylamide-containing alleged psilocybin samples to "smooth out the trip." This compound was detected in 29.6 per cent of the samples analyzed by the Minneapolis group and in only 12.9 per cent of the samples reported by the three California groups. This clearly indicates that phencyclidine was more readily available ($p = <0.001$) in the Minneapolis area than in California. Since street phencyclidine is probably diverted from legal channels of distribution, this greater availability in Minneapolis raises some interesting questions as to how this diversion is accomplished.

The same observation also appears to apply to the illicit amphetamines, since they appeared to be more readily available ($p = <0.001$) in the Minneapolis area than in California, *i.e.* 20.2 per cent of the Minneapolis samples investigated contained some amphetamine while only 7.9 per cent of the samples analyzed by the three California groups contained some amphetamine.

Conversely, cocaine appears to be less available in Minnesota ($p = <0.001$) than in California, since only 3.5 per cent of the Minneapolis samples contained cocaine while 13.8 per cent of the California samples contained this compound. The prevalence of cocaine may increase in the Minneapolis area since illicit drug use tends to commence in California and then spread to other areas of the United States.

In conclusion, non-governmental street drug analysis programs do have a place in the community. They provide factual information that is essential for (i) providing realistic drug-misuse education, (ii) allowing medical institutions to anticipate the frequency and nature of toxicological emergencies, (iii) predicting trends of drug preference, (iv) predicting drug availability in a community, (v) providing some indication of the impact of law enforcement on the availability of illicit drugs.

It is worth emphasizing once again that the charge is fallacious that these programs act as "quality control" for illicit drug dealers. The dealer is interested in money, his single goal is to sell the drug of choice to the user at a profit. The data summarized in Tables II-VII substantiate this point. The widespread availability of these data is simply

not in the best interests of the "illicit drug dealer." The increase in the number of publications concerned with the rapid analysis of street drugs in reputable scientific journals (67-69) indicates that the scientific community sees the need for these programs and the benefits that they provide the community.

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Is Street Drug Analysis Necessary in Canada?

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This paper is organized into five major sections intended to introduce some general issues of street drug analysis in Canada, review the recent historical and legal background, identify the primary potential and current sources of data, briefly summarize the available street level information on a drug-by-drug basis, and to reconsider the present and likely future Canadian street drug analysis needs with the aim of making some useful suggestions regarding further efforts in this area.

INTRODUCTION

Accurate up-to-date information regarding the identity and purity of drugs in non-medical use is necessary for meaningful administrative control and regulation, for adequate public health protection and treatment, for realistic drug education and for valid and socially relevant research, both in the laboratory and on the street. Although most non-medical drug use in Canada today involves legally produced and distributed substances under reasonable quality control such as alcohol and tobacco, or legitimately manufactured pharmaceutical preparations sometimes diverted from legal channels, completely clandestine production and distribution of certain drugs is common. Drugs obtained from the illicit or 'bootleg' market are often incorrectly identified, of inconsistent and unknown quality and strength, may be contaminated, and are occasionally mixed with other drugs. Consequently, it is often difficult to generalize from controlled

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experimental studies employing known quantities of clinically pure compounds to situations involving the use of illicit drugs. Because of the uncertain identity of some drugs, epidemiological data based on self-reports of non-medical drug use may contain errors of considerable proportions. As well, drug identification in medical treatment reports is almost always based on verbal reports by the patients, rather than on chemical analysis of the drugs involved; erroneous classification of such cases frequently occurs. Samples of the drugs taken are not usually available for chemical analysis, and rapid and accurate detection of drugs in body fluids is often beyond the capacity of clinical or hospital laboratories.

Although there seems to be a consensus as to the general need for accurate information on street drugs there is some disagreement as to what data are actually required and how they are to be used, and what are the most appropriate methods of obtaining the necessary 'street level' information about non-medical drug use. There seem basically to be two related but distinct approaches to street drug analysis reflecting general versus specific needs. One orientation is concerned, in a broad epidemiological sense, with the general picture of non-medical drug use in society, while the other focuses on highly specific information in an individual case. For example, medical and forensic needs are often highly specific, while the requirements for public policy formulation are typically very broad in scope. Primary sources of relevant data in Canada include police drug seizures, unsolicited samples submitted to treatment-oriented analytic facilities and, to a much lesser extent, samples collected in field studies. Law enforcement and medical data sources have very significant characteristic sampling biases which greatly limit the generality of the information which they can provide.

HISTORICAL AND LEGAL BACKGROUND OF STREET DRUG ANALYSIS IN CANADA

Systematic analysis of general street drugs for non-forensic purposes was first undertaken in Canada at the Addiction Research Foundation of Ontario (ARF) in Toronto in 1969. Technical assistance in setting up the laboratory and supplies of standard reference samples were provided to the Foundation by the Food and Drug Directorate (now Health Protection Branch) of the Department of National Health and Welfare. Various other laboratories across the country were involved from time to time in street drug analysis on a more limited and less systematic basis. The legal position of the analysts and the persons delivering samples of prohibited drugs for analysis was ambiguous, but a number of facilities operated on the premise that such work was justified under provincial health statutes.

As a result of pressure from local law enforcement officials, in early 1970 the ARF collection and analysis of illicit street drug samples were temporarily suspended, pending legal clarification. Some critics argued that the services provided by the Foundation in this project facilitated the refinement of certain illicit drug manufacturing and trafficking activities — in other words, they were concerned that such analyses and subsequent feedback would provide a source of quality assessment for the illicit market. The Foundation, on the other hand, contended that the laboratory project had not become a service to the 'black market', but was a significant aid to medical treatment, a valuable source of epidemiological data for research and educational purposes, and a potentially important independent source of information input to the criminal-justice system.

In the *Interim Report* (1) of the Commission of Inquiry into the Non-Medical Use of Drugs (hereafter simply referred to as "the Commission") the following observation was made:

> It is feared by some that such facilities and information may encourage the use of drugs by advertising their availability and reducing dangers. It has been further suggested that distributors will take advantage of these facilities to have their products tested and, as it were, approved. Whatever force there may be in these arguments, they are outweighed, it would seem, by the necessity of a thorough and effective commitment to know as much as possible about what is happening in non-medical drug use and to make such knowledge available for the benefit of those who may be prudent enough to be guided by it. We have more to fear from willful ignorance than we do from knowledge in this field. . . Sample analysis and wide dissemination of the results can only serve in the long run to deglamourize drugs and drug taking. (1, p. 228)

The Commission felt that for various reasons the existing federal forensic analytic facilities could not meet the general national needs for information on illicit market drugs. For example, the FDD and RCMP laboratories were not considered timely or appropriate sources of information for persons involved in medical treatment and research. At the time of the *Interim Report* the ARF laboratory project had been suspended; at any rate it had been a significant general service primarily to those in Southern Ontario only. The Commission recommended:

> . . .that the Federal Government actively investigate the establishment of regional drug analytic laboratories at strategic points across the country. . . . Such laboratories should not be connected with government or law enforcement, and should be free from day to day interference by public authorities. (1, p. 228.)

In November 1970, amendments to the *Food and Drugs Act* (2) and the *Narcotic Control Act* (3) were passed which clarified the legal position of those involved in such laboratory operations, and provided a protocol for federal approval and authorization. Under those regulations, physicians were permitted to receive samples of prohibited drugs from individuals under their professional care, and to transmit such samples to a scientist authorized to conduct the analysis. Feedback from the analyst regarding the contents of illicit samples was restricted to the physician, and the responsibility for any further dissemination of the information was rather ambiguously left in his or her hands. In 1971 and 1972, certain aspects of these regulations were modified, and currently, physicians can receive drug samples for analysis from persons other than their patients.

The Federal Government soon authorized illicit drug analysis in various university, hospital, government, and private laboratories, and provided standard reference samples for this work. However, initially no direct federal financial support was provided for analytic programs outside of the Department of National Health and Welfare. Federal officials contended that such activities fell within the area of the delivery of health services and, consequently, should appropriately be developed through provincial auspices and support. However, in the summer of 1971, the Department conducted drug analysis workshops to provide chemists from across the country with up-to-date information on standard techniques for the quantitative and qualitative analysis of drugs likely to be encountered on the street. A technical manual entitled *Some Analytical Methods for Drugs Subject to Abuse* was produced and distributed (4). Recently the Federal Government has given financial support for a few research-oriented non-government street drug analysis programs.

The Federal Government expanded the facilities of the Health Protection Branch (HPB) drug laboratories in Ottawa as well as the regional laboratories, and in 1971, initiated a special police seizure analysis program concerned with the strength and purity of certain illicit drugs. In addition, HPB laboratories have continued on a very limited scale to analyse street drugs for physicians "on an emergency basis".

Today most of the non-forensic analysis of illicit drugs in Canada takes place at the Addiction Research Foundation in Toronto. By early 1973, over 100 individuals in more than 50 different laboratories across the country had been authorized to conduct illicit drug analysis, but only a small proportion of these are seriously involved in street drug work, and very few have a program of notable magnitude. Although they are fully authorized, technically qualified, and usually adequately equipped, for a variety of reasons most of the laboratories are not very actively involved in street drug analysis. Lack of adequate financial support has been a considerable stumbling block and, as a result, some labs either charge rather high prices for the service (as much as $40.00 per sample) or have abandoned such work altogether. The laboratories with somewhat successful programs have generally had to incorporate much or all of their costs into existing hospital, research, or university budgets. In many areas of the country the anticipated street drug workload has not materialized — perhaps because of an absence of local interest or need, strict financial considerations and/or a lack of knowledge of the availability of such services by treatment personnel, illicit drug users and the general public (17).

In its *Final Report* (5) the Commission has made further observations and recommendations to the Federal Government regarding street drug analysis needs and facilities.

MAJOR SOURCES OF STREET DRUG INFORMATION

As noted earlier, there are three primary sources of chemical information about street drugs in Canada: (1) police seizures; (2) treatment-oriented laboratories; and (3) special field studies. Because of the necessarily selective nature of law enforcement coupled with the fact that only a minute fraction of illicit drug users are ever arrested, data obtained from police drug seizures can provide an adequate basis for generalization only to those sectors of the population that are the primary subjects of police attention, and cannot be considered representative of the illicit drugs generally available. Since only a very limited sector of the illicit drug-using population has contact with treatment-oriented drug analysis laboratories, and because unsolicited samples submitted to such facilities for analysis are often associated with some adverse or unusual reaction, or are suspected of being misrepresented on the illicit market or in some other way uncommon or odd, as a group such samples likely contain a greatly disproportionate number of deviant items. These sampling biases must be kept in mind in the discussions which follow.

Although many authorized laboratories have, from time to time, analysed street drug samples which were not directly connected to immediate health care concerns, there have been few studies in Canada of illicit drug samples which were actively solicited in the field (*i.e.* on the street) on a systematic basis for specific research purposes. Because of various practical and legal problems, there has been no serious effort on a broad scale to obtain a representative sample of street drugs in Canada. Serious questions can be raised regarding the legal status of such research within the framework of the present federal regulations.

The primary existing sources of street drug analysis information in Canada are specifically identified below and some corresponding data are presented in tabular form for later reference and discussion.

Sources of Police Seizure Data

The Health Protection Branch (HPB) Field Operations Directorate's regional laboratories and the Drug Research Laboratories of the HPB Drugs Unit in Ottawa provide most of the federal forensic drug identification, although the Royal Canadian Mounted Police (RCMP) crime detection laboratories are also involved in such work. A detailed summary of the total police seizure exhibits analysed by HPB laboratories from April 1970 to March 1973 is presented in Table I.

The relative number of exhibits of each drug in Table I reflects the emphasis of primary police activity and concern, as well as the availability of the drug on the illicit market. Similarly, variation from year to year in the number of exhibits of a particular drug may reflect either changes in illicit availability or use, or may reflect changes in law enforcement activity in that sector. It is not possible to differentiate these alternatives in the available data. Many factors are likely operating. It would appear that compared to cannabis, no other drug accounts for a very significant proportion of the analytic work load. With the exception of LSD-PCP mixtures, specific drug combinations are generally not included in the primary summaries provided by HPB. Except for the occasional presence of impurities inherent in the synthesis or degradation of certain drugs, other mixtures make up only a very small proportion of the total exhibits.

As noted above, in June 1971, HPB initiated a special police seizure analysis program concerned with the strength and purity of certain illicit drugs. This detailed qualitative and quantitative study has concentrated on some specific synthetic and semi-synthetic drugs – mainly heroin, methamphetamine, phencyclidine (PC)), and methylenedioxyamphetamine (MDA). Generally, samples were selected for special examination if any indication of impurities or drug mixtures appeared in the initial routine forensic analysis after seizure. However, as LSD-PCP combinations are relatively common compared to other drug mixtures, only a small proportion of such samples is included. With this exception, it appears that the vast majority of all police seizures of drug mixtures involving any of these substances have been included for further detailed analysis in this program. As well, a certain number of relatively pure samples were included in the study from time to time, the selection process depending in part upon size of the regular laboratory workload at the time and other rather unpredictable factors. Certain aspects of the data from the first 16 months of the program (June 1971 – October, 1972) are summarized and discussed in various sections which follow. Table II presents the qualitative data on drug mixtures for this period.

Although it is not possible to define the precise sampling and data base from which these figures are derived, on the basis of the first year of the program, the Field Operations Directorate estimated that approximately one-tenth of all police seizure samples involved more than a single chemical entity (6). However, more than three-quarters of the 'mixtures' contained only a primary drug and chemicals considered inherent to its synthesis or breakdown. Deliberate adulteration which was considered cause for concern was almost non-existent. Since many of the samples in the study were selected for this special analysis because of previously detected impurities or mixtures, as noted above, the quantitative data from the program (discussed below) can only provide a limited picture of the concentration of active materials in illicit street drugs in general.

TABLE I

POLICE SEIZURE EXHIBITS ANALYSED BY THE HEALTH PROTECTION BRANCH LABORATORIES, APRIL 1970 – MARCH 1973.[a]

	1970-1971		1971-1972		1972-1973	
		%		%		%
Sedative Hypnotics						
Barbiturates	248	1.16	233	0.88	339	0.85
Chlordiazepoxide	42	0.20	56	0.21	NS[a]	
Diazepam	26	0.12	78	0.30	NS	
Methaqualone	23	0.11	84	0.32	NS	
Others	11	0.05	10	0.04	NS	
Stimulants						
Amphetamine	65	0.30	77	0.29	68	0.17
Methamphetamine	600	2.81	1138	4.32	1640	4.12
Phenmetrazine	79	0.37	157	0.60	47	0.12
Methylphenidate	3	0.01	6	0.02	NS	
Diethylpropion	3	0.01	16	0.06	NS	
Cocaine	29	0.14	76	0.29	202	0.51
Hallucinogens						
Cannabis						
Marijuana	6594	30.86	8067	30.62	13933	35.04
Hashish	6238	29.20	6824	25.90	9640	24.24
THC	0		0		0	
Total Cannabis	12,832	60.06	14,891	56.51	23,573	59.28
LSD	2384	11.16	1795	6.81	1601	4.03
LSD & PCP[c]	23	0.11	339	1.29	394	0.99
PCP	101	0.47	270	1.02	426	1.07
MDA	395	1.85	593	2.25	1352	3.40
STP (DOM)	11	0.05	1	0.00	0	
DMA	5	0.02	16	0.06	20	0.05
LBJ	0	0.00	41	0.16	2	0.00
Mescaline	9	0.04	11	0.04	NS	
Psilocybin	0	0.00	0	0.00	NS	
Opiate Narcotics						
Opium	7	0.03	21	0.08	42	0.11
Morphine	52	0.24	56	0.21	45	0.11
Codeine	48	0.22	42	0.16	48	0.12
Heroin	777	3.64	1211	4.60	2566	6.45
Methadone	58	0.27	90	0.34	129	0.32
Pethidine	35	0.16	31	0.12	22	0.06
Propoxyphene	19	0.09	29	0.11	NS	
Pentazocine	1	0.00	8	0.03	NS	
Others						
Procaine	5	0.02	20	0.08	NS	
Quinine	9	0.04	41	0.16	NS	
Total Specified	17,900	83.7	21,437	81.4	32,516	81.8
Other exhibits[d]	3,735	17.3	4,912	18.6	7,250	18.2
Total exhibits analysed	21,635	100	26,349	100	39,766	100

[a] From "Identity of police drug exhibits" prepared by the Computer Services Bureau of the Health Protection Branch, Ottawa. Fiscal years cover the period from April 1 to March 31. Table adapted from the *Final Report of the Commission into the Non-Medical Use of Drugs*, Information Canada, 1973.

[b] NS = not specified under the reporting system initiated May, 1972. Currently, only the major categories, considered by HPB to be of primary interest, are specified on the summary lists.

[c] LSD-PCP combinations are considered separate from exhibits of either LSD or PCP alone. No other specific drug combinations are included in the summaries.

[d] Exhibits analysed, but not specified in the HPB summaries. Many of these exhibits involve non-drug substances seized by the police.

TABLE II

SOME DRUG MIXTURES OR IMPURITIES FOUND IN POLICE SEIZURES BY HEALTH PROTECTION BRANCH LABORATORIES. JUNE 1971 – OCTOBER 1972[a]

Primary Drug	Other Drugs or Impurities	No. of Samples
1. Methamphetamine	(a) impurities[b]	132
	(b) amphetamine & impurities[b]	68
	(c) amphetamine	3
	(d) atropine	9
	(e) PCP & procaine	4
	(f) others	9
2. Cocaine	(a) procaine	5
3. LSD	(a) PCP	34
	(b) methaqualone & antihistamine	14
	(c) ergonovine[b]	12
	(d) others	3
4. PCP	(a) ephedrine	12
	(b) LBJ & methylbenzilate[b]	10
	(c) others [See also 1(e) & 3(a).]	5
5. MDA	(a) heroin	3
	(b) others	4
6. Heroin	(a) impurities[b]	116
	(b) caffeine & impurities[b]	6
	(c) methaqualone & diphenhydramine	4
	(d) quinine	3
	(e) others [See also 5(a).]	11

[a] Data provided by the Field Operations Directorate, Health Protection Branch, Ottawa. Combinations occurring three or more times are specified in the Table; the remainder appear as "others". Table adapted from the *Final Report of the Commission into the Non-Medical Use of Drugs*, Information Canada, 1973.

[b] Identified as or presumed to be substances inherent to the synthesis or degradation of the primary drug.

The Commission conducted two special studies of police drug seizures (7). In the first study, 90 samples from 20 different police exhibits of heroin (seized during 1968-70) were selected from the vaults of the Bureau of Dangerous Drugs for detailed qualitative and quantitative analysis. In the second police seizure study, a total of 92 marijuana and 71 hashish exhibits (seized during 1970-71) were selected; quantitative data were obtained on 57 and 43 of these cannabis exhibits respectively. These cannabis data are summarized in Tables V and VI below.

Primary Non-Forensic Sources of Street Drug Data

During the initial phase of the Addiction Research Foundation's street drug analysis project, the investigators released several reports (9), culminating in a general summary in 1970 (10). Since the Foundation's project has been reinstated, the investigators have described various aspects of the program (11, 12). The Foundation has provided analysis for the Commission field studies and has kept us informed as to current developments in their program.

During the period from 1971 to the Fall of 1972 the Commission surveyed all authorized street drug analysis laboratories, asking for information on the alleged and identified contents of samples received, general analytic methods employed, etc. (7). In addition to these survey data, we specifically sought out samples on a country-wide basis which were thought to be rare or unusual drugs or combinations. We also obtained qualitative and quantitative analyses of samples of marijuana and hashish used by a group of young adult cannabis users in a log-book study of their drug consumption patterns (13). As well, many unsolicited drug samples were submitted and were included in the general study. Overall, the Commission accumulated analytic reports on 980 street drug samples from these various sources, not including the special studies of police seizures. Tables III and IV provide a general qualitative summary of these data. Much of the earlier quantitative and qualitative cannabis data is presented in greater detail below in Tables V and VI.

The major portion of the survey data was provided by the Addiction Research Foundation program.[2] Consequently, these data are heavily biased with Ontario samples and cannot be considered representative of the country as a whole. Incidentally, some samples analysed by the Foundation for Commission field studies have been included in the analytic summaries which ARF issues periodically. Consequently, there may be significant overlap of samples in apparently separate summaries of the Foundation's program and of Commission projects. Unless stated as such, summary reports from these two sources should not be assumed to be completely independent. (Note that HPB laboratories in Ottawa also participated in the analysis of Commission field study samples.)

OVERVIEW OF AVAILABLE DATA

Alcohol

Most of the alcohol purchased or consumed illicitly in Canada comes originally from licensed brewers and distributors. However, thousands of gallons of liquor are illegally manufactured and consumed in Canada annually. In some instances considerable effort is made to imitate or counterfeit popular brands; bottles are often prepared complete with false labels and bogus Liquor Board stamps.

[2]The vast majority of the analytic reports provided to the Commission in its national survey of analytic facilities (and summarized in Tables III and IV) came from the Addiction Research Foundation, Toronto; Ontario Department of Health, Toronto; Lakeshore Psychiatric Hospital, Toronto; Institut de Recherches Psychiatriques de Joliette, Joliette; University of New Brunswick, Federicton; St. Boniface General Hospital, St. Boniface; University of Alberta Hospital, Edmonton; and Food and Drug Directorate (now HPB) regional laboratories and RCMP laboratories. Note that only street drug analysis reports not associated with law enforcement were included from the latter two sources.

TABLE III

ALLEGED AND IDENTIFIED CONSTITUENTS OF 'STREET DRUG' SAMPLES IN CANADA, 1971–1972[a]
PART I: BY ALLEGED IDENTITY

ALLEGED TO BE			IDENTIFIED AS			
A. SINGLE DRUGS	No. of Samples	% of Total A.[b]	Same As Alleged	Alleged Drug & Other(s)	Non-Alleged Drug(s)	No Drug
Cannabist[c]	145	20.3	111 (76.6%)	1 (0.7%)	3 (2.0%)	30 (20.7%)
Cocaine	7	0.1	3 (42.9%)	1 (14.3%)	2 (28.6%)	1 (14.3%)
Heroin	18	2.5	9 (50.0%)	–	3 (16.7%)	6 (33.3%)
LSD	162	22.7	111 (68.5%)	23 (14.2%) impurities[d] 8 barbiturates 7 other(s) 8	14 (8.6%)	14 (8.6%)
MDA	64	9.0	27 (42.2%)	13 (20.3%) impurities[d] 9 other(s) 4	17 (26.6%)	7 (11.0%)
Mescaline	171	24.0	5 (3.0%)	–	135 (78.9%) LSD 43 LSD & PCP 33 PCP 18 STP 11 Methamphetamine 9 LSD & LSA 3 other(s) 18	31 (18.1%)
Methamphetamine	86	12.1	30 (34.9%)	33 (38.4%) barbiturate 9 amphetamine 6 impurities[d] 5 PCP 3 MDA 3 other(s) 7	17 (19.8%) MDA 4 other(s) 13	6 (7.0%)

(Continued)

TABLE III (Continued)

ALLEGED TO BE			IDENTIFIED AS			
A. SINGLE DRUGS	No. of Samples	% of Total A.[b]	Same As Alleged	Alleged Drug & Other(s)	Non-Alleged Drug(s)	No Drug
Psilocybin	32	4.5	–	1 (3.1%)	20 (62.5%) LSD 15 other(s) 5	11 (35.0%)
PCP	2	1.0	1 (50.0%)	1 (50.0%)	1 (50.0%)	–
THC	26	3.6	–	–	21 (80.8%) PCP 18 other(s) 3	5 (19.2%)
TOTAL A.	713	100	296 (41.5%)	73 (10.2%)	233 (32.7%)	111 (15.6%)
B. DRUG MIXTURES	No. of Samples	% of Total B.[e]	Same As Alleged	One of Alleged Drugs	Non-Alleged Drug(s)	No Drug
Cannabis & Opiate	6	11.5	–	6 cannabis 5 opiate 1	–	–
Cannabis & PCP	3	5.8	1	cannabis 2	–	–
Cannabis & Other	3	5.8	–	cannabis 3	–	–
Heroin & MDA	3	5.8	–	MDA 2	LSD & impurity[d] 1	–
Heroin & Methamphetamine	5	9.6	–	3 methamphetamine & impurity[d] 2 methamphetamine & PCP 1	2 MDA 1 PCP 1	–
LSD & MDA	3	5.8	–	LSD 3	–	–
LSD & Other	7	13.5	1	LSD 6	–	–
Mandrax®	5	9.6	–	methaqualone 5	–	–

(Continued)

TABLE III (Continued)

ALLEGED TO BE			IDENTIFIED AS					
B. DRUG MIXTURES	No. of Samples	% of Total A.[b]	Same As Alleged	Alleged Drug & Other(s)		Non-Alleged Drug(s)		No Drug
MDA & Harmaline	4	7.7	–	MDA	4	–		–
MDA & Other	2	3.8	–	MDA	1		1	–
Mescaline & Other	4	7.7	–	–		LSD &/or PCP	3	1
Methamphetamine & Other	4	7.7	–	methamphetamine	2	*d*-amphetamine	1	1
Other	3	5.8	–	tobacco	1	LSD	1	1
TOTAL B.	52	100	2 (3.8%)	38 (73.1%)		9 (17.3%)		3 (5.8%)
C. UNSPECIFIED SUBSTANCES	No. of Samples					Identified Drugs		No Drug
	215	–	–	–		150 (69.8%)		65 (30.2%)
						LSD	25	
						methamphetamine	18	
						cannabis	11	
						MDA	10	
						methaqualone	8	
						ASA	8	
						LSD & PCP	7	
						barbiturate	4	
						PCP	4	
						tetracycline	4	
						tobacco	3	
						phenmetrazine	3	
						methamphetamine & PCP	3	
						other(s)	42	
GRAND TOTAL	980							

[a] Data from Miller, R. D., Oestreicher, P., Marshman, J., Beckstead, H., Paterson, R. and associates. Chemical analysis of illicit drugs in Canada (Commission Research Project, 1973). Table adapted from the *Final Report of the Commission into the Non-Medical Use of Drugs*, Information Canada, 1973. With the exception of alleged mixtures (Section B), generally only those drugs reported three or more times are identified here; the remainder are unspecified or appear as "others". (See also Table IV)

[b] Per cent of the total number (713) of alleged single drugs reported.

[c] For detailed information on marijuana and hashish, see Tables V and VI.

[d] Substance considered inherent to the synthesis or degradation of the primary drug.

[e] Per cent of the total number (52) of alleged drug combinations reported.

TABLE IV

ALLEGED AND IDENTIFIED CONSTITUENTS OF 'STREET DRUG' SAMPLES IN CANADA, 1971–1972[a]
PART II: BY CHEMICAL IDENTIFICATION

IDENTIFIED AS			ALLEGED TO BE			
A. SINGLE DRUGS	No. of Samples	% of Total A.[b]	Same As Identified	Identified Drugs & Other(s)	Other(s)	Not Specified
ASA	13	2.0	–	–	5 (38.5%)	8 (61.5%)
Amphetamine	8	1.2	–	–	7 (87.5%)	1 (12.5%)
Barbiturate	8	1.2	–	–	4 (50.0%)	4 (50.0%)
Cannabis[c]	136	20.9	111 (81.6%)	10 (7.4%)	4 (2.9%)	11 (8.1%)
Chlordiazepoxide	4	0.6	–	–	2 (50.0%)	2 (50.0%)
Cocaine	5	0.8	3 (60.0%)	–	1 (20.0%)	1 (20.0%)
Heroin	9	1.4	9 (100.0%)	–	–	–
LSD	208	31.8	111 (53.4%)	9 (4.3%)	63 (30.3%) mescaline 43 psilocybin 15 other(s) 5	25 (12.0%)
MDA	52	8.0	27 (51.9%)	7 (13.5%)	8 (15.4%) methamphetamine 4 other(s) 4	10 (19.2%)
Mescaline	6	0.9	5 (83.3%)	–	–	1 (16.7%)
Methamphetamine	62	9.5	30 (48.4%)	2 (3.2%)	12 (19.4%) mescaline 9 other(s) 3	18 (29.0%)
Methaqualone	15	2.3	–	5 (33.3%)	2 (13.3%)	8 (53.4%)

(Continued)

TABLE IV (Continued)

IDENTIFIED AS			ALLEGED TO BE			
B. DRUG MIXTURES	No. of Samples	% of Total A.[b]	Same As Identified	Identified Drugs & Other(s)	Other(s)	Not Specified
PCP	47	7.2	–	–	43 (91.5%) mescaline 18 THC 18 other(s) 7	4 (8.5%)
Quinine	3	0.5	–	–	3 (100.0%)	–
STP	13	2.0	–	–	11 (84.6%) mescaline 11	2 (15.4%)
Tetracycline	4	0.6	–	–	–	4 (100.0%)
Tobacco	5	0.8	–	1 (20.0%)	1 (20.0%)	3 (60.0%)
Others	54	8.3	–	1 (1.8%)	23 (42.6%)	30 (55.6%)
TOTAL A.	652	100.0%	296 (45.4%)	35 (5.4%)	183 (29.0%)	132 (20.2%)

B. DRUG MIXTURES	No. of Samples	% of Total B.[e]	Same as Identified	One of Identified	An Identified drug & Other(s)	Other(s)	Not Specified
Amphetamine & methamphetamine	6	4.0	–	6 (100.0%) methamphetamine 6	–	–	–
Amphetamine & other drugs	6	4.0	–	5 (83.3%)	–	1 (16.7%)	–
Barbiturate & LSD	7	4.7	–	7 (100.0%) LSD 7	–	–	–
Barbiturate & methamphetamine	10	6.7	–	9 (90.0%) methamphetamine 9	–	–	1 (10.0%)
Cocaine & other drugs	3	2.0	–	1 (33.3%)	–	2 (66.7%)	–

(Continued)

TABLE IV (Continued)

IDENTIFIED AS			ALLEGED TO BE			
B. DRUG MIXTURES	No. of Samples	% of Total A.[b]	Same As Identified	Identified Drugs & Other(s)	Other(s)	Not Specified
LSD & impurities[d]	16	10.7	–	8 (50.0%) LSD 8	–	7 (43.8%) mescaline 4 other(s) 3	1 (6.2%)
LSD & MDA	3	2.0	–	3 (100.0%)	–	–	–
LSD & methamphetamine	5	3.4	–	3 (60.0%)	–	2 (40.0%)	–
LSD & PCP	45	30.3	1 (2.2%)	–	–	37 (82.2%) mescaline 33 other(s) 4	7 (15.6%)
LSD & other drugs	5	3.4	–	5 (100.0%) LSD 5	–	–	–
MDA & methamphetamine	4	2.7	–	3 (75.0%) methamphetamine 3	–	–	1 (25.0%)
MDA & impurities[d]	9	6.0	–	9 (100.0%) MDA 9	–	–	–
Methamphetamine & PCP	7	4.7	–	3 (42.9%) methamphetamine 3	1 (14.2%)	–	3 (42.9%)
Methamphetamine & other drugs or impurities[d]	13	8.7	–	7 (53.8%) methamphetamine 7	2 (15.4%)	1 (7.7%)	3 (23.1%)
Opiate Narcotic combinations	4	2.7	–	1 (25.0%)	–	1 (25.0%)	2 (50.0%)
Miscellaneous combinations	6	4.0	1 (16.7%)	3 (50.0%)	–	2 (33.3%)	–
TOTAL B.	149	100%	2 (1.3%)	73 (49.0%)	3 (2.0%)	53 (35.6%)	18 (12.1%)

(Continued)

TABLE IV (Continued)

IDENTIFIED AS			ALLEGED TO BE				
C. NO DRUG	No. of Samples	% of Grand Total	Same As Identified	Identified Drugs & Other(s)		Other(s)	Not Specified
						Alleged Drugs	No Drug
	179	18.3				114 (63.7%)	65 (36.3%)
						cannabis 30	
						mescaline 31	
						LSD 14	
						psilocybin 11	
						MDA 7	
						methamphetamine 6	
						heroin 6	
						THC 5	
						other drugs 4	
GRAND TOTAL	980		298 (30.4%)	73 (7.4%)	38 (3.9%)	356 (36.4%)	215 (21.9%)

[a] Data from Miller, R. D., Oestreicher, P., Marshman, J., Beckstead, H., Paterson, R., and associates. Chemical analysis of illicit drugs in Canada (Commission Research Project, 1973). Table adapted from the *Final Report of the Commission into the Non-Medical Use of Drugs,* Information Canada, 1973.
Generally, only those drugs reported three or more times are identified here; the remainder are unspecified or appear as "others". (See also Table III)

[b] Per cent of the total number (652) of single drugs identified.

[c] For detailed information on marijuana and hashish, see Tables V and VI.

[d] Substances considered inherent to the synthesis or degradation of the primary drug.

[e] Per cent of the total number (149) of drug combinations identified.

Police seizures provide the only source of data regarding the chemical characteristics of illicit alcohol in Canada. Among the contaminants which have been identified are calcium and copper salts, hydrocarbon oils, vegetable debris, dead insects, feces, and urine. These materials result from uncontrolled and unsanitary production conditions, including easy access for insects and rodents, the use of dirty vessels and hard or unclean water, and abnormally high acid content in the brewing mash. Lead from old radiators used as condensors in illicit stills is occasionally found as well. Deliberate additives include various sugars, soft drinks, various flavouring and colouring matter, and glycerol. Toxic quantities of methyl alcohol are sometimes added inadvertently. Illicit alcohol is typically diluted with water and the strength of such spirits is highly variable and unpredictable, with approximate limits of 30-160 proof. (18, 19)

Tobacco

Since there are no legal restrictions on the cultivation of tobacco in Canada, illicitly purchased or consumed supplies of this drug come originally from licit sources. The use of 'home grown' tobacco is apparently rare. The nicotine content of tobacco varies considerably, but averages about 1.5 per cent in cigarettes. In addition, more than 500 other compounds, many of which are pharmacologically active, have been isolated from tobacco smoke (5).

Cannabis

In Canada, cannabis is rarely adulterated or mixed with other drugs (with the exception of hashish and tobacco), although various plant materials are sometimes represented as marijuana or are used to dilute or 'cut' it, and occasionally the odd beef bouillon cube or brown sugar sample is represented as hashish. In the available studies more than three-quarters of the samples presented to analysts as hashish or marijuana were what they were alleged to be; the remainder were almost all inactive substances. No cases of 'opiated' hash or grass, alleged to be pure, have been identified in Canada. All of the cannabis samples submitted to the Commission by regular cannabis users were as alleged. Tetrahydrocannabinol (THC) has not been found in isolated form on the illicit market: 18 of the 26 alleged THC samples were identified as phencyclidine (PCP); five contained no drug (Tables III and IV).

Serious questions have been raised regarding possible contamination of marijuana with herbicides, pesticides, and toxic fungi. Although the Commission made preliminary efforts to investigate these contentions, appropriate systematic analyses have apparently not been attempted.

The THC content of the hashish analysed in Commission studies ranged from a mere trace to an unusually high value of 14.3 per cent, and in marijuana from near zero to 3.5 per cent (See Table VI). Although limited, these data suggest that in Canada 'typical hashish' contains about 5 per cent Δ^9 THC, while 'typical marijuana' contains about 0.6 per cent. Very little, or no, Δ^8 THC was found in these samples. The hashish analysed contained a much higher percentage of the total cannabinoids in the form of cannabidiol (CBD) and cannabinol (CBN), than did the marijuana.

TABLE V

DETAILED SUMMARY OF QUALITATIVE ANALYSES OF ILLICIT CANNABIS SAMPLES IN CANADA, 1969-1971[a]

Source	Alleged Identity	Date Analyzed	Number Analyzed	Number Pure Cannabis	Remainder
1) Commission Samples					
A. Street samples[a,b] (Ont., Que., B.C.)	Marijuana	1970-71	21	21 (100%)	
	Hashish	1970-71	31	30 (97%)	1 — no drug
B. Selected police seizure samples[a] (National)	Marijuana	Aug. 1971 & Dec. 1971	88	84 (95%)	4 — no drug
	Hashish		71	64 (90%)	7 — no drug
2) Samples From Other Sources (Addiction Research Foundation, Toronto, Ontario. St. Boniface Hospital, St. Boniface, Manitoba. Lakeshore Psychiatric Hospital, Toronto, Ontario)	Marijuana	Apr. - Dec. 1971	29	20 (67%)	6 — no drug 1 — marijuana + PCP 1 — plant with atropine-like alkaloids 1 — marijuana + LSD
	Hashish	Apr. - Nov. 1971	19	11 (57%)	3 — no drug 1 — hashish + tobacco 1 — plant with atropine-like alkaloids 2 — opium 1 — A.S.A.
	Total Marijuana		138	125 (91%)	10 — no drug 2 — marijuana + other drug 1 — other drug
	Total Hashish		121	105 (87%)	11 — no drug 1 — hashish + other drug 4 — other drug
	Total Cannabis		259	230 (89%)	21 — no drug 3 — cannabis + other drug 5 — other drug
3) Published Data[c] (Addiction Research Foundation)	Marijuana	Jan. 1969 to Feb. 1970	91	65 (71%)	26 — no drug
	Hashish		58	52 (90%)	6 — no drug

(Continued)

TABLE V (Continued)

Source	Alleged Identity	Date Analyzed	Number Analyzed	Number Pure Cannabis	Remainder
	Total Cannabis		149	117 (78%)	32 — no drug
	Grand Total Marijuana		229	190 (83%)	36 — no drug 2 — marijuana + other drug 1 — other drug
	Grand Total Hashish		179	157 (88%)	17 — no drug 1 — hashish + other drug 4 — other drug
	Grand Total Cannabis		408	347 (85%)	53 — no drug 3 — cannabis + other drug 5 — other drug

[a] These samples were analysed for the Commission by H. D. Beckstead, of the Pharmaceutical Chemistry Division, Department of National Health and Welfare.

[b] These samples were analysed for the Commission by J. Marshman and R. Berg of the Addiction Research Foundation of Ontario.

[c] Marshman, J.A. & Gibbins, R. J. A Note on the Composition of Illicit Drugs. *Ontario Medical Review*, September, 1970. p. 429.

From *Cannabis: A report of the Commission of Inquiry into the Non-Medical Use of Drugs*, Information Canada 1972, Ottawa.

TABLE VI

QUANTITATIVE ANALYSES OF SOME ILLICIT CANNABIS SAMPLES, 1970-1971[a]

Source	Drug	Number	Location	Date Obtained	Date Analyzed	Percentage Δ^9 THC		Percentage* Δ^8 THC		Percentage CBD		Percentage CBN		Percentage Total Cannabinoids	
						Range	Median	Range	No. where detected	Range	Median	Range	Median	Range	Median
1. COMMISSION SAMPLES															
Street Samples[b,c]	Marijuana	15	4 Unknown 11 Ontario	Apr. - May 1971	June - Dec. 1971	0.02- 3.46	0.93	0.00-0.02†	6 (40%)	0.00- 2.00	0.12	0.00-0.30	<0.10	0.78- 4.10	1.38
	Hashish	23	23 Ontario	Apr. - May 1971	June - Dec. 1971	1.00-14.30	4.82	0.0 -0.20‡	21 (91%)	1.09-12.90	5.50	0.00-2.63	0.66	2.80-25.39	11.32
Canadian Grown Illicit Marijuana															
(A) Street Samples[b,c,d]	Marijuana	11	4 Ottawa 2 Montreal 5 B.C.	Apr. & Sept. 1971	June & Nov. 1971	0.02- 3.46	0.44	0.00-0.02§	8 (73%)	0.01- 1.13	0.58	0.00-0.04	0.00	0.05- 4.04	1.06
(B) Selected Police Seizures[j]	Marijuana	4	4 B.C.	Seized Mar. - Dec. 1971	July, 1971	0.32- 1.02	0.80	—	0 (0%)	0.07- 0.16	0.10	0.00-0.06	0.02	0.40- 1.20	0.94
Total of A & B	Marijuana	15				0.02- 3.46	0.56	0.00-0.02	8 (53%)	0.01- 1.13	0.16	0.00-0.06	0.01	0.05- 4.04	1.05
2. POLICE SEIZURES															
Sample[b]	Marijuana	44	9 Ontario 4 Quebec 16 Prairies 11 B.C. 4 Maritimes	Seized Mar. - Dec. 1970	July, 1971	0.05- 1.65	0.21	0.00-0.01	7 (16%)	0.00- 1.02	0.06	0.00-0.54	0.16	0.11- 2.12	0.53
	Hashish	34	8 Ontario 5 Quebec 9 Prairies 7 B.C. 5 Maritimes	Seized Mar. - Dec. 1970	July, 1971	0.00- 8.60	1.30	—	0 (0%)	0.00-16.50	3.60	0.00-2.70	0.75	0.60-26.00	6.00
Sample II[b]	Marijuana	9	7 Ontario 2 Quebec	Seized Oct. 1971	Dec. 1971	0.02- 1.53	0.27	0.01-0.03	5 (55%)	0.03- 2.20	0.29	0.00-0.03	0.00	0.31- 2.48	0.82
	Hashish	9	6 Ontario 3 Quebec	Seized Nov. 1971	Dec. 1971	0.80- 6.40	5.40	0.10-0.20	3 (33%)	2.20-13.60	11.70	0.00-1.00	0.30	4.70-20.20	15.3

[b] These samples were analysed for the Commission by H. D. Beckstead, of the Pharmaceutical Chemistry Division, Department of National Health and Welfare.

[c] These samples were analysed for the Commission by J. Marshman and R. Berg of the Addiction Research Foundation of Ontario.

[d] Includes: one sample also included in "Street Samples", above.

† Based on quantitative analyses of four street samples.

‡ Based on quantitative analyses of four street samples.

§ Based on quantitative analyses of ten street samples.

[a] From *Cannabis. A report of the Commission Of Inquiry into the Non-Medical Use of Drugs*, Information Canada 1972, Ottawa.

* Quantitative analyses for Δ^8 THC were not done at the Addiction Research Foundation.

Most of the cannabis available in Canada is apparently imported, marijuana coming primarily from the south (*i.e.* Mexico) and hashish mostly from the Middle East. However, with the appropriate seeds, marijuana with relatively high THC content can be easily grown in this country, and 'home grown weed' is becoming increasingly common. Liquid cannabis extract or concentrate (e.g. 'hash oil') has become intermittently available during the past two years.

LSD and Other Hallucinogens

LSD is the most frequently encountered of the psychedelic-hallucinogenic drugs (excluding cannabis). LSD alone or in combination with other drugs was detected in 292 (66%) of the 445 hallucinogen (non-cannabis) samples in the Commission study. PCP was found in 104 (23%) and methylenedioxyamphetamine (MDA) was identified in 72 (16%) of these samples. (Note that because of drug mixtures, these categories are not mutually exclusive.) In total, LSD, PCP, MDA, or combinations involving these drugs made up 94 per cent of such samples; no other hallucinogenic drugs were significant factors in comparison. Data from the Addiction Research Foundation and the Health Protection Branch provide generally similar pictures. Dimethoxymethylamphetamine (DOM or STP) and methylpiperidylbenzilate (LBJ) have been identified on relatively few occasions. Other LSD-like drugs, such as mescaline and psilocybin, have rarely been documented in Canada.

It would appear that most of the LSD, PCP and MDA available on the illicit market is of reasonable quality, although evidence of rather crude manufacture is present in many samples of LSD and MDA. Concern has been expressed regarding the possible toxic effects of ergot alkaloids present in some LSD samples as a result of faulty or incomplete synthesis. Since there has been no direct testing of the biological activity of such samples, firm conclusions can not be drawn. Serious toxicity would seem unlikely at typical LSD doses because of the small quantities of ergot compounds generally involved, although unusually large doses of poorly synthesized LSD may involve some risk. Although the original source of illicit PCP is uncertain, no evidence of products of faulty or incomplete synthesis of this drug has been found in Canada.

PCP is rarely identified as such on the illicit market, but instead is sold alone or in mixtures, primarily represented as mescaline, THC or, less commonly, other rare drugs. Consequently, epidemiological data involving self-reports by users, as well as clinical data of adverse reaction or poisoning, are likely to grossly underestimate the involvement of PCP. Chemical identification of the drugs involved in such reports is almost non-existent at the present time. Any PCP cases are likely to be erroneously attributed to other drugs. Reports involving the illicit use of mescaline or psilocybin (e.g., as in the Federal *Poison Control Program Statistics* (14)) likely actually represent LSD and/or PCP cases.

Drug combinations involving hallucinogens are not rare, but with the exception of PCP, most samples contain only a single primary drug. PCP is the only drug in these data which occurs less often alone than in combination with other drugs (primarily with LSD). This is especially significant since there is virtually no experimental information available on PCP-LSD interaction in humans.

In Manitoba, a poisoning was attributed to an overdose of the stimulant strychnine, which had reportedly been sold as MDA. In all of the data reviewed here, strychnine was not found in any of the combinations where it was alleged to occur, but was tentatively

identified in 4 other instances (all in the Prairies). Strychnine was not found in any of 2,000 police seizure drug samples analysed by the HPB in 1971, nor has it ever been identified in the analyses conducted at the Addiction Research Foundation of Ontario.

No samples of *para*-methoxyamphetamine (PMA) appeared in any of the data presented here, but in the past nine months considerable attention has been focused on this new entry to the illicit market because of several overdose deaths attributed to the drug in Canada and the U.S. Fortunately the drug is rare and most of the samples identified in this country have apparently come from a common source.

In the HPB special study, the 117 unit doses of LSD-containing samples (excluding LSD and PCP) ranged from a mere trace of LSD to 305 mcg, with a median of 141 mcg LSD. The eight PCP alone samples averaged 10.9 mg phencyclidine. Median values for 26 unit doses of LSD-PCP mixtures were 41 mcg LSD and 1.8 mg PCP. The 61 unit doses of MDA ranged from 0.6 to 107 mg pure MDA with a median of 37.5 mg. The 57 MDA exhibits in powder form were between 0.1 per cent and 91.3 per cent pure with a median of 36.7 per cent.

Amphetamines

Methamphetamine is the most common of the stimulant drugs noted in reports of police seizures and street drug analyses in Canada. Other amphetamines and amphetamine-like drugs (e.g., phenmetrazine and methylphenidate) are occasionally noted, but relatively few such samples have been identified in street drug studies. When found, these latter drugs are typically of high quality and apparently were originally produced by legitimate manufacturers. The methamphetamine available on the illicit market, however, is usually prepared in clandestine laboratories and is often misrepresented or of poor quality, sometimes contaminated by products of faulty or incomplete synthesis, and may be mixed with other drugs. About two-thirds of the samples submitted for analysis as methamphetamine were found to contain that drug. In half of these cases a second drug was present as well.

In the HPB special study, 286 methamphetamine-containing seizures were analysed. These samples were almost exclusively in bulk powder or 'crystal' form (as opposed to capsules or tablets) and ranged from 0.6 per cent to 97.2 per cent pure methamphetamine with a median of 39.2 per cent. Gibbins (15) found a generally similar picture in a group of methamphetamine samples obtained from 'speeders' in Toronto. In addition, he reported that methamphetamine samples sold as grams (i.e., 'street grams') on the illicit market in Toronto typically contained less than one-tenth the specified quantity of the drug.

Cocaine

Although cocaine can no longer be considered rare in Canada, only a few samples of the drug appeared in the data reviewed here. Procaine and amphetamine are reportedly sometimes distributed as cocaine or are used to dilute it. Various sugars (e.g., lactose) are common diluents. In the HPB special study, the 10 seizures of cocaine analysed ranged from 6.3 per cent - 94.2 per cent pure, with a median value of 53.4 per cent.

Opiate Narcotics

Opium is relatively rare in Canada. Methadone, morphine, codeine and pethidine (meperidine) are occasionally noted in police seizure reports. These latter drugs are generally of high purity and are presumed to originate from legal manufacture. In the Commission's general survey, 18 drug samples had been represented as heroin. Of these, only 9 contained any opiate narcotics. Out of the 980 drug analyses summarized, opiates were identified in only 11 cases where the substance had been unspecified or alleged to be another drug.

As noted above, no case of 'opiated' hashish or marijuana, alleged to be pure, has ever been chemically documented in Canada in spite of the popular impression that this is an established combination. If 'opiated' hashish is in fact non-existent as it appears to be, this common misconception could have significant implications for the interpretation of much North American survey data on the extent of opiate narcotic use. Most survey questions regarding the use of opiates have not been adequately specific, and it is likely that a significant number of opiate-naïve cannabis users have erroneously admitted to experience with opiate narcotics as a result of having tried what was mistakenly presumed to be 'opiated hash' or 'smack grass'.

A study by FDD scientists of police seizures of heroin during 1959-60 indicated that the illicit heroin available in Canada was of surprisingly high quality. (16). Ninety-five per cent of the 229 seizures examined contained between 24 and 68 mg of heroin per capsule, with a mean of 46 mg. The mean purity of these samples was 53 per cent.

In the Commission quantitative study of heroin seized by the police in 1968-70, samples packaged in unit doses (capsules or envelopes) ranged in total weight from 9 mg to 143 mg with a median of 77 mg. The quantity of heroin in these units ranged from 0.6 mg to 94 mg with a median of 25.6 mg. The purity of these samples covered a range of 0.5 per cent to 96 per cent heroin, with a median of 35 per cent. Although a few large seizures showed considerable uniformity among capsules, significant variation in heroin content within single bulk seizures was typical. For example, the content of 10 capsules selected randomly from a total of 60 seized in a single package varied between 21 mg and 62 mg of pure heroin. In another case, the content of 5 seemingly identical capsules from the same source ranged from 0.6 mg to 30 mg of heroin.

In the HPB special study, 168 police seizures of heroin were quantitatively analysed. The actual diacetylmorphine content per packaged unit dose ranged from 5.4 mg to 92.5 mg with a median of 33 mg, and the purity of bulk powder samples ranged from 1.4 per cent to 100 per cent with a median of 25.6 per cent.

Adulteration of heroin with other drugs is apparently rare. The substance most often noted in Canadian reports of diluted or cut heroin is lactose. Quinine, a drug which was a common diluent in the U.S., (16, 20) is rarely found in Canadian samples. Products of faulty or incomplete synthesis (such as monoacetylmorphine) are often found. It would appear that opiate narcotics are very rarely disguised or misrepresented as other drugs in Canada, although some of the materials sold as opiate narcotics on the illicit market may not contain any heroin or morphine.

Barbiturates, Non-Barbiturate Sedative-Hypnotics and Minor Tranquilizers

In spite of a well documented increase in the popularity of certain sedative-hypnotics, there has been surprisingly little systematic analysis of these drugs in Canada. In the

Commission's study, no barbiturates had been presented to the analysts as such, although barbiturates were detected in 28 samples which had been either unidentified or alleged to be some other drug. Fifteen samples containing methaqualone were reported, but no other non-barbiturate sedatives or minor tranquilizers were mentioned more than a few times. The HPB quantitative analysis study of police seizures does not focus on these drugs, although methaqualone was identified in 20 samples combined with other drugs. There is no evidence of clandestine manufacture of sedative hypnotics in Canada. The few samples which have appeared in street drug analyses apparently came from legal sources.

Summary

Subject to the sampling restrictions noted earlier, the data available provide some tentative conclusions regarding the psychotropic drugs used non-medically in Canada. The vast majority of all street drug samples analysed contain cannabis, LSD, methamphetamine, PCP or MDA. No other drugs are significant factors in comparison. Although one frequently hears rumours of bizarre and esoteric new compounds generated by 'hippy chemists', in spite of a certain flux of novel drug names, few new drugs or combinations actually become significant items on the illicit market. Rather than being highly variable and dynamically changing, the street drug picture in Canada seems remarkably predictable and stable.

The Commission data are particularly significant in this regard since special effort was made to obtain information on rare or unusual drugs or combinations, yet on analysis, samples of such substances were almost invariably found to contain only common drugs. Drug combinations are not rare, but with the exception of LSD-PCP combinations, the vast majority of samples contain only a single active compound. Samples which are represented as mixtures on the illicit market are rarely as alleged and typically contain only one active substance. It is obvious from the data that misidentification and deception often occur in certain sectors of the illicit drug market and that the drugs available are frequently highly variable, both in terms of purity and strength. The user has little objective basis for assessing the identity, quality or dose of many drugs prior to use. The present studies are biased in favour of collecting and identifying mixtures and unusual drugs and consequently exaggerate the frequency of their occurrence in the general illicit market.

CANADIAN STREET DRUG ANALYSIS NEEDS

As indicated earlier, there is a virtual consensus that it is to society's benefit to maintain an accurate picture as to the chemical characteristics of the illicit street drugs in non-medical use. There is still some controversy, however, regarding exactly what information is actually necessary and what would be the most practical system for obtaining that data. Considering the various sampling biases of the present data sources, and the impracticality of conducting an adequately representative survey of samples of drugs for which a possessional offense exists, some combination of available techniques would seem the most reasonable approach to a general monitoring of the overall national picture, for research and public policy purposes.

Given the facilities presently available in Canada, placing primary emphasis on a continuing systematic random selection and analysis of police drug seizure samples seems

to be the best option for providing the backbone for a general street drug monitoring system. The HPB special study of seizure exhibits is a significant step in this direction, but much effort has been wasted in the program because of sampling problems. What is needed to improve this project is not analysis of a greater number of samples than are currently included, but the development of a more systematic sample selection procedure and a clearer delineation of the seizure populations and samples involved. In fact, with proper sampling, the total number of exhibits analysed and consequently the overall laboratory workload and the operating cost of the program could be significantly reduced. The special analysis might be expanded to include a broader range of drugs, an occasional inquiry into possible herbicides, pesticides and toxic fungi in cannabis and an assessment of insoluble particles in those drugs likely to be injected by the user.

Because of the inherent sampling biases in law enforcement activities, such police seizure data must be continuously supplemented in a systematic fashion by information from at least a few key treatment oriented or general street drug analysis facilities in the major cities across the country, and by occasional specific field studies. Most of the street drug analysis data currently being generated by various laboratories across the country is not being efficiently utilized. With the exception of the ARF program, there seems to be no general integrated analysis of street drug reports and little attempt to disseminate the available information. The various laboratories actively involved in such work might usefully form a centrally coordinated information network, facilitating and encouraging the uniform collection, analysis and dissemination of street drug data. Within such a framework a systematic attempt might fruitfully be made on a broad scale to identify sampling biases, and to correlate the chemical characteristics of the individual samples with the pharmacological, medical, social and legal conditions leading to the analysis. Through such efforts it seems that a significant improvement in our general knowledge of and capacity to monitor changes in the current street drug scene could be achieved at relatively little additional expense.[3]

However, the effective use of street drug analysis in the medical diagnosis and treatment of problems associated with acute and chronic drug effects poses somewhat different problems. It is frequently said that rapid street drug analysis would be of considerable immediate importance to the treatment of adverse psychological reactions. However, since drug-specific treatment is generally not available anyway, accurate drug identification would not seem to be as significant a contribution to the management of psychological adverse reactions as is often contended. The handling of such cases is usually based on the interpretation of behavioural symptoms, and most commonly involves 'talking down' and, often, the administration of minor tranquilizers, regardless of the original drugs involved. On the other hand, the availability of data correlating chemical identification with adverse reaction symptoms might in the long run provide a basis for the subsequent development of more drug-specific and efficient treatment methods.

In cases of severe physical poisoning, rapid identification of the chemicals involved would be invaluable, but traditional drug analysis methods are often unable to provide the necessary information quickly enough to be of effective use, even in the uncommon event that adequate samples of the drugs taken are immediately available. Currently, emergency poisoning or overdose treatment is primarily based on observable symptoms

[3] It is relevant here to note the extent to which the availability and use of street drugs in Canada generally follows U.S. trends. The few new substances to gain notoriety on the Canadian illicit market in recent years were first detected and described by researchers in the U.S. In anticipating possible future trends, Canadians can profit considerably from careful and systematic observation of U.S. street drug analysis programs.

and verbal reports by the patient or his friends as to the chemicals involved. Immunoassay of drug, blood or urine samples might require only minutes for drug identification, and would be extremely useful in many such emergencies, but very few treatment facilities in North America are presently equipped for such methods.

Similarly, in the treatment of adverse effects of chronic drug use, chemical identification of the substances taken is generally not of paramount importance, since, again, drug-specific treatment is generally not provided or available – particular physical disorders and symptoms and behavioural conditions are treated instead. With few exceptions, chronic dependent drug users, as well as persons involved with them on a treatment basis likely maintain a fairly accurate picture of the primary drug(s) in question.

Even though there is considerable misrepresentation, ignorance and fraud within the illicit drug distribution system, the deliberate adulteration of single drugs with other chemicals (excluding LSD and PCP) or the substitution of more dangerous chemicals for an alleged drug is relatively rare in Canada. It would appear that drug users are presently more likely to be cheated than injured by the information gap as to the identity of illicit drugs.

Overall, it appears that the importance of specific street drug sample analysis in medical treatment may have been overstated in the past. Even when such analysis is available, it is typically not a significant therapeutic factor. However, it is important that adequate general information is available to enable treatment personnel to maintain a reasonable idea of what to expect from the street. Of course, analytic facilities must be available for those instances where the identity of a particular sample is considered critical for therapeutic or research purposes. In addition, it is relevant to note again that the collection of data obtained from treatment-related street drug analyses has contributed to our overall understanding of the identity and availability of various drugs on the illicit market and, in that regard, can provide a valuable supplement to police seizure data and special field studies.

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This article is based in part on background papers prepared for the Commission of Inquiry into the Non-Medical Use of Drugs. Some of the material presented here, and further discussion of certain topics, appear in the Commission's *Cannabis Report* and *Final Report.*

Gas Chromatographic-Mass Spectrometric Analysis of Street Drugs, Particularly in the Body Fluids of Overdose Victims

Catherine E. Costello[1]

The doctor confronted with a comatose patient about whom he has little or no medical history has an analytical problem facing him which must be solved both accurately and quickly. Our laboratory at Massachusetts Institute of Technology, which is under the direction of Professor Klaus Biemann, meets this need with a screening test which employs a gas chromatograph/mass spectrometer/computer system (gc/ms) (1). Within one to two hours we are able to furnish the doctor with the results so that he can take remedial action which is specifically directed toward the drugs ingested and therefore most effective in treating the patient. In many cases, the drugs involved in the overdose are street drugs — and it is to these instances in particular that this paper will refer.

THE GC/MS/COMPUTER SYSTEM

First, what is this system and what are its advantages over other methods of analysis? Fig. 1 is a schematic representation of the instrumentation (2, 3). The gas chromatograph is a separation device which simplifies the complex mixtures obtained by extraction of body fluids or dosage formulations into a series of single-component fractions. A record of the passage of material through this device is called a gas chromatogram. Fig. 2 is the gas chromatogram obtained for the extract from a tablet found in the possession of an overdose victim. The purified materials are then passed directly into the mass spectrometer. In the mass spectrometer the molecules eluting from the gas chromatograph are

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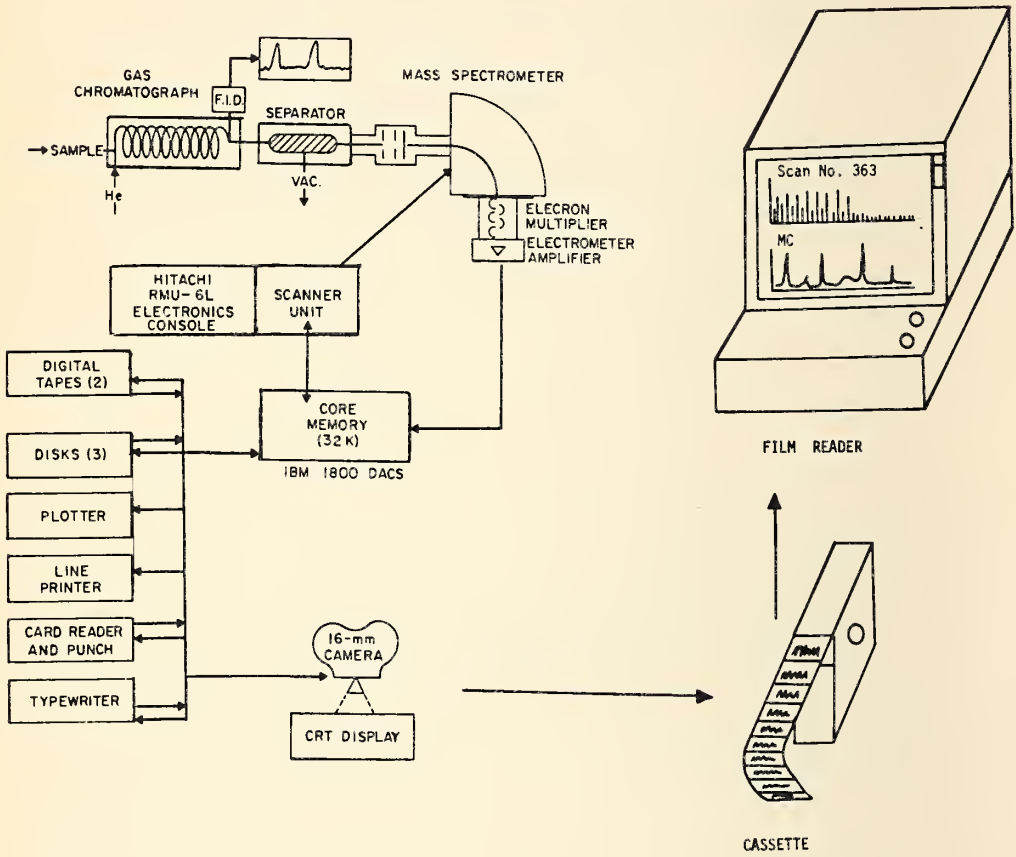

Figure 1. *Schematic representation of the gas chromatograph/mass spectrometer/computer system in use at MIT.*

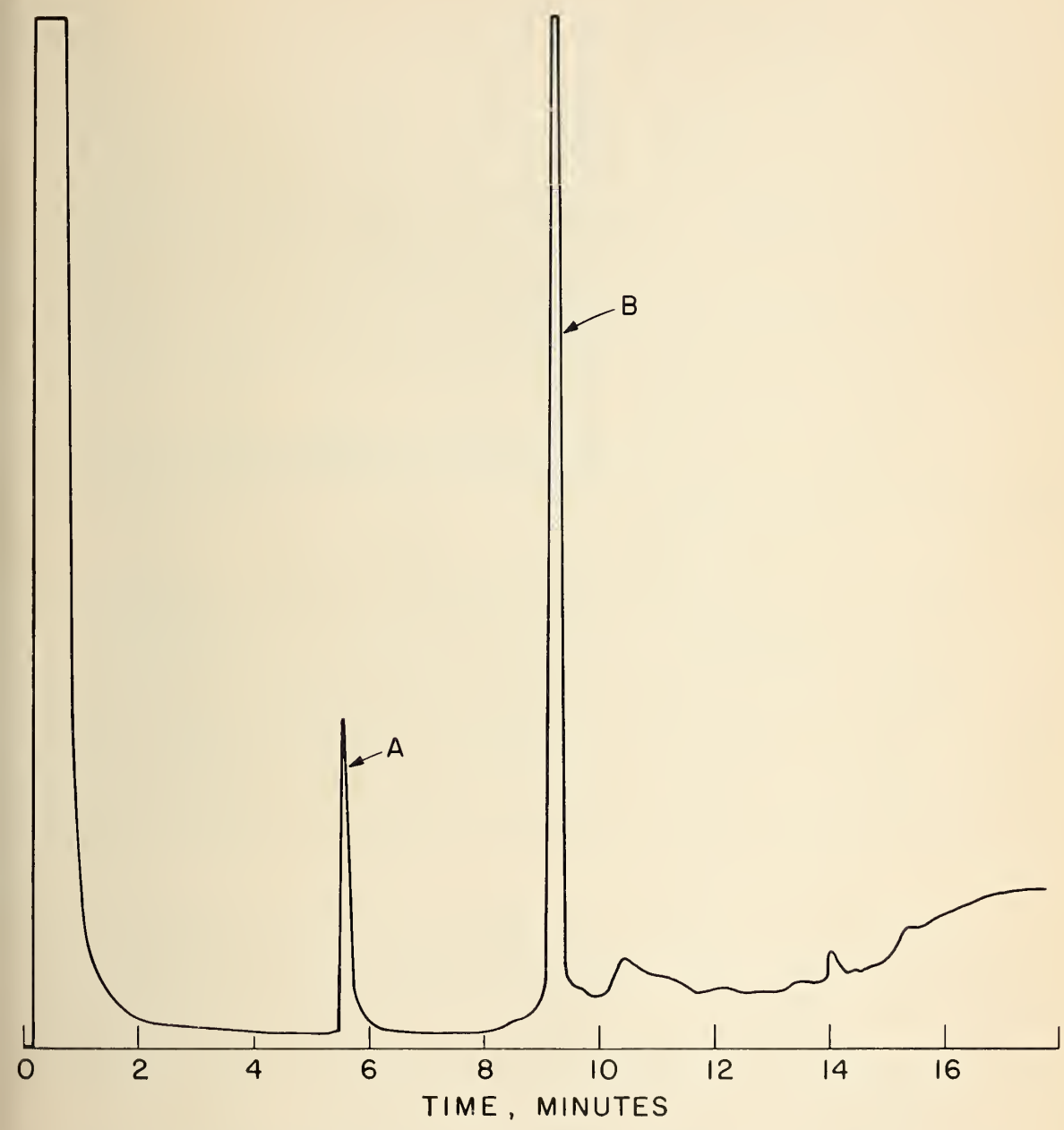

Figure 2. *Gas chromatogram of extract from tablet found in possession of overdose victim. Conditions: 3% OV-17 on GC-Q in 5' x 1/8" stainless steel, temperature programmed at 16°/min from 80° to 330°C.*

converted into ions, some of which fragment. Molecular ions and fragment ions pass through a magnetic field where the variation in their sizes causes them to be deflected differently. The pattern produced by this behavior is called a mass spectrum. Figs. 3A and 3B are the mass spectra of phencyclidine (B) and 1-phenyl cyclohexene (A), a frequent contaminant in street samples of this drug. These spectra were obtained at points A and B during the gas chromatogram in Fig. 2. The computer accumulates the mass spectra recorded continuously every 4 seconds during the gas chromatogram and compares these data to a collection of authentic spectra of drugs, metabolites, natural products and common impurities. It then prints out the results of its search as shown in Fig. 4. The computer listing contains the names of up to 10 compounds included in the collection in order of decreasing similarity of their spectra to the spectrum obtained during the gas chromatogram, together with a number from 0-1 which indicates the degree of similarity (4). If the exact drug is not already in the collection, the type of drug which does appear on the list will often give a clue as to the identity of the unknown. The mass spectrum can then be interpreted by the chemist to deduce the structure of the unknown drug.

This approach to the analytical problem presented by overdoses has several advantages over more conventional methods:

1. *Broad range* An extremely wide variety of drugs and other toxic substances can be screened for simultaneously so that precious time is not wasted doing a series of tests, each of which is of limited application.

2. *Speed* Tests of body fluids can be done in one to two hours.

3. *Specificity* The exact structure of the unknown is deduced, so that behavioral variations even within a related group of drugs can be allowed for during treatment.

4. *Sensitivity* Even in the presence of large amounts of other material, drugs can be successfully determined at extremely low levels — and in the case of certain types of drugs, for example, phenothiazines, phencyclidine, lysergic acid diethylamide (LSD), blood levels of only a fraction of a milligram per cent may be present even when the patient has ingested an overdose of the drug. Fig. 5 illustrates how a specific plot of the mass 200 detects phencyclidine in a blood extract so complex that the drug would go undetected by gas chromatography alone.

5. *Independence of the necessity for co-determination of standard compounds* Because a mass spectrum is reproducible and independent of minor instrumental variations, a collection of mass spectra may be assembled for long-term use, and redetermination of standards is not necessary — as it is with tests which depend on color development or gas or thin-layer chromatographic retention data alone. Such collections can be exchanged between laboratories so that unnecessary repetition of labor is avoided. (Over 300 copies of the drug spectra collection compiled in this laboratory have been distributed.)

6. *Interpretability of data* If new drugs are encountered, their probable structures can be deduced from the data. This feature is particularly valuable in analysis of street drugs, since new drugs may be synthesized by "bathtub" chemists and for these, obviously, no reference materials are, at first, available. This flexibility also permits the elucidation of structures of metabolites which may also be unknown. In instances of multiple drug ingestion, it is essential to identify which gas chromatographic peaks are drugs and which metabolites, so that completeness of the analysis may be assured. Fig. 6 illustrates the complexity of the extract of a urine sample in which several drugs and their metabolites were found, as indicated in the caption. It may also happen that a drug is

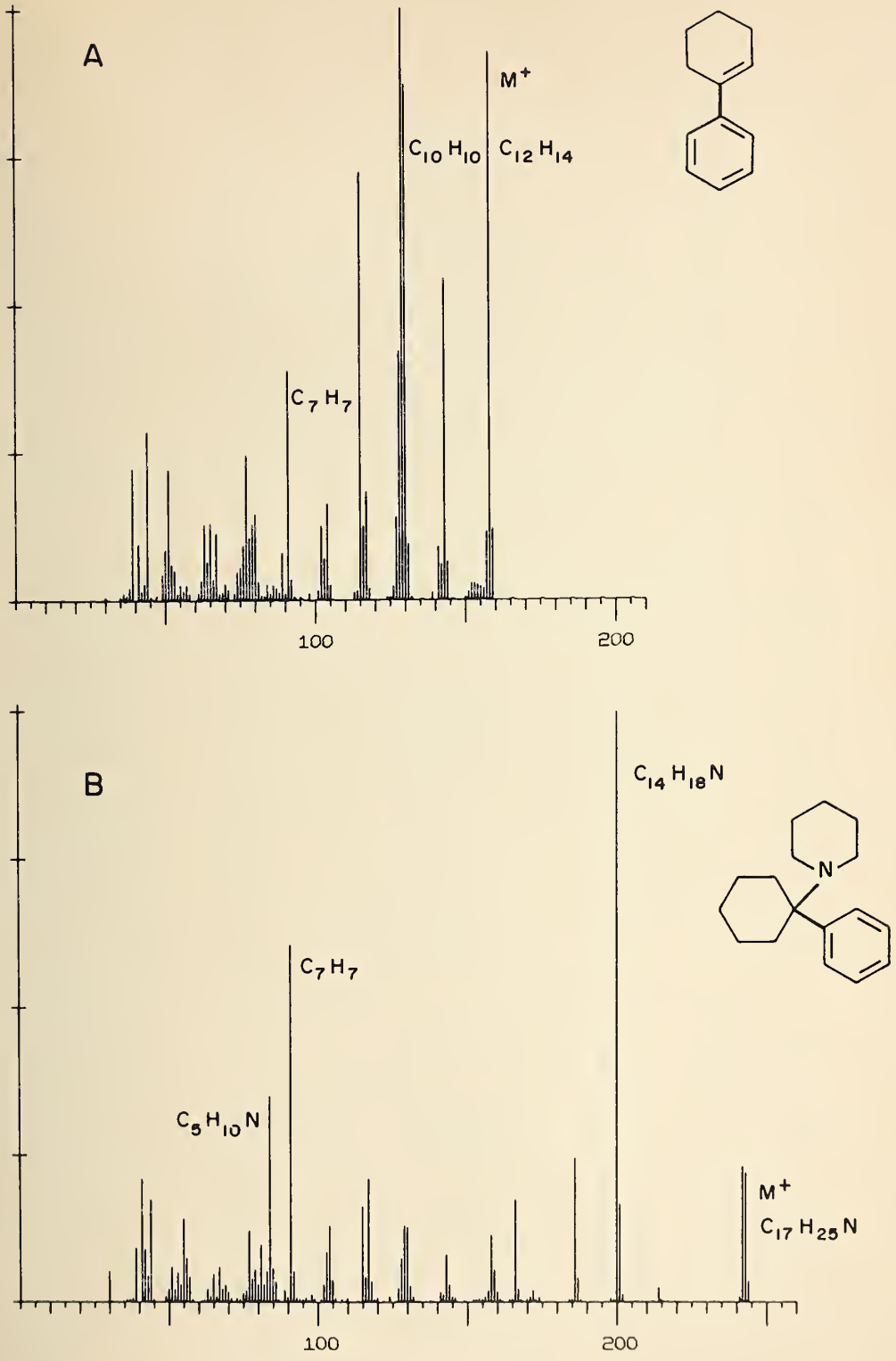

Figure 3. *Mass spectra obtained during gas chromatogram in Fig. 2. Spectra are in accord with structures of (A) 1-phenyl cyclohexene and (B) phencyclidine.*

```
PILL 558, CHMC                                                    69      RUN NO. =  2279

ABBREVIATED SPECTRUM
  30     6      39   223      41    94      50    86      51   221      63   128      65   131      77   244
  80   144      91   387     102   125     115   722     117   183     129   999     130   871     141    91
 143   543     158   924     159   120

RESULTS
                                                                  ID.          SIM.
 1-PHENYL CYCLOHEXENE                                             159          0.310

*****************************************************************************************************************

PILL 558, CHMC                                                   121      RUN NO. =  2279

ABBREVIATED SPECTRUM
  30    53      31     3      39    92      41   211      55   142      56    75      65    47      67    60
  77   123      84   351      91   605     103    84     115   162     117   209     129   131     130   127
 143    80     144    31     158   116     159    54     166   176     167    23     186   246     187    43
 200   999     201   168     202    13     214    24     242   231     243   219     244    35

RESULTS
                                                                  ID.          SIM.
*PHENCYCLIDINE                                                   176          0.727

*****************************************************************************************************************
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Figure 4. *Computer output for comparison of spectra (A) and (B) in Fig. 3 with reference collection.*

Figure 5. *Overplot of mass 200 on total ionization plot obtained for extract of blood serum containing phencyclidine (spectrum index number 153). Maximum at spectrum index number 208 is due to a contaminant in the sample.*

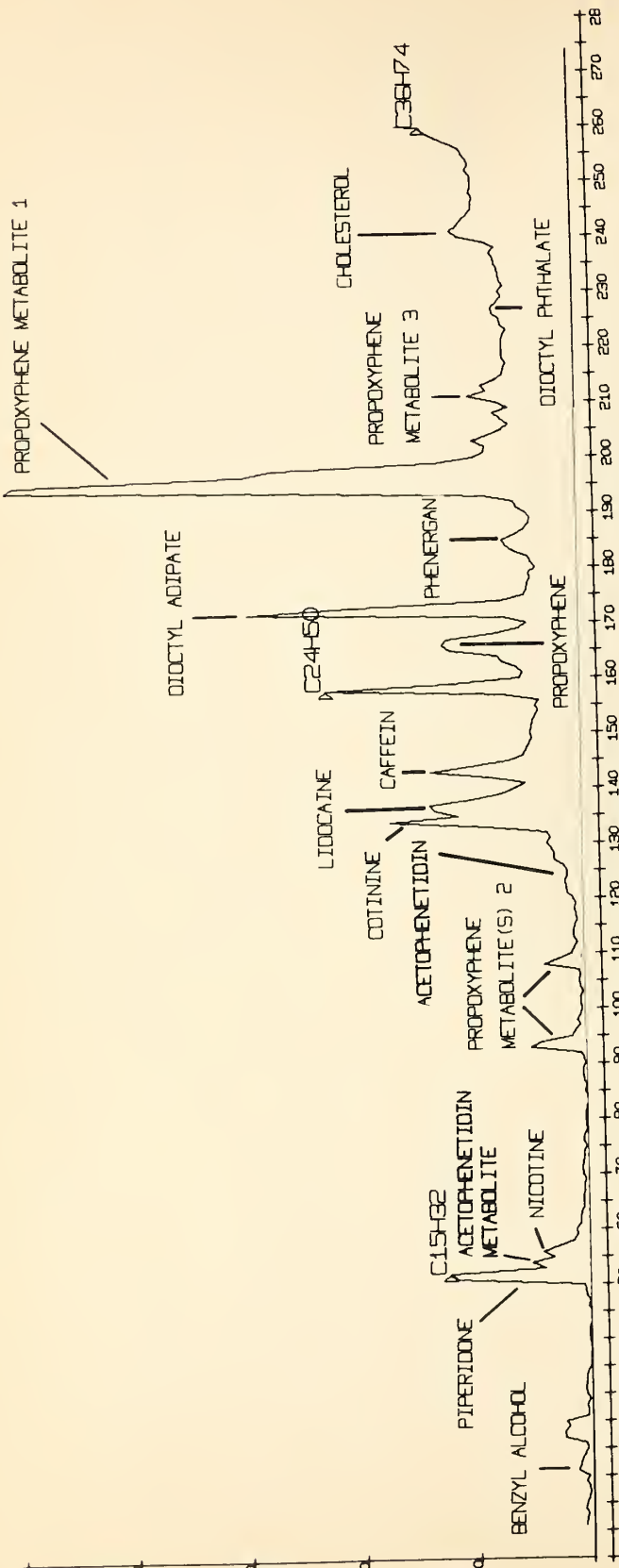

Figure 6. *Total ionization plot of urine extract containing several drugs and their metabolites. Labelled peaks have been identified from their mass spectra. Hydrocarbons are reference compounds added during analysis.*

completely degraded by the body, so that its presence must be recognized solely by identification of its metabolites. The presence of 1,1,1-trichloro-ethanol in the urine is indicative of ingestion of chloral hydrate, although none of the unchanged drug seems to be excreted.

EMERGENCY DRUG ANALYSIS

In the two years during which we have been providing emergency analysis for hospitals in the Boston area, we have examined the body fluids of more than six hundred persons. Among those found to have ingested toxic quantities of drugs, about 10 to 15 per cent had consumed what may be called street drugs. (The distinction is sometimes hard to define.) In most of these cases, there was no prior information about the patient's access to drugs so that the identification of the toxic material was critical in determining the course of treatment. Since some of the patients were either very young (under 2) or no longer young (over 50) the presence of street drugs had not even been anticipated and narrower approaches would therefore probably not have detected the drugs actually found. Consideration of these results makes it obvious that analysis for street drugs must be included in any emergency drug treatment program.

The application of data obtained for overdose cases to the study of patterns of drug use and availability is also apparent. Fig. 7 graphically illustrates the cyclic pattern of use of a few drugs based on samples submitted to our laboratory. Although the sample sizes are limited, trends do seem to be indicated.

More useful than analysis of body fluids for documentation of supplies is, of course, analysis of dosage forms obtained from street sources in a given community. Our experience with street samples has paralleled that reported elsewhere: that gross misrepresentations are rampant (Table I). Although this type of analysis occupies only a minor role among the activities of our laboratory, the contact which we thus maintain with counselling services does keep us aware of what is circulating in the community — often even before we encounter the first overdose of a drug which is new to the area, as indicated in Fig. 7.

Our experience has shown, however, that analysis of drugs found on the persons of overdose victims is not always a reliable guide to determining the nature of the ingested material. In 10 to 20 per cent of the cases in which blood and/or urine were analysed as well as confiscated dosage forms, the patient was found to have ingested drugs other than, or in addition to, the recovered drug. For this reason, the extraction and analysis of available body fluids is to be recommended whenever possible in cases of overdosage. Our practice has been first to examine a confiscated dosage form of a drug found on or with a patient because this procedure is even more rapid than body fluid analysis and may yield useful information very quickly, but to follow this immediately with analysis of body fluids to confirm that the confiscated drug was in fact the one responsible for the patient's condition.

Analysis of street samples for the purpose of affecting drug usage is not carried out in our laboratory. The counselling services for whom we occasionally analyze samples have utilized the information provided by our laboratory in talking with drug users but report that the results seem to have little effect on the patterns of abuse (5). The greatest usefulness for these agencies from the point of view of patient care is the contact that results from offering such a service, with persons who might not otherwise make use of the facility.

TABLE I

RESULTS OF ANALYSIS OF STREET DRUG SAMPLES SUBMITTED TO MIT

Alleged Contents	Analytical Results (ordered by frequency)
Amphetamine, amobarbital	Amphetamine
LSD	LSD LSD, amphetamine
Mescaline	LSD 2, 5-Dimethoxyamphetamine, Phencyclidine, propoxyphene Phencyclidine, cocaine
Methaqualone	Methaqualone
Phencyclidine	Phencyclidine
Psilocybin	LSD Methaqualone, indomethacin
Strychnine (LSD, mescaline)	Phencyclidine
THC	THC (plant material) Phencyclidine (tablets, powder, some plant material)
Unknown	Phencyclidine LSD Barbital Methaqualone Aspirin Caffeine Acetophenetidine Codeine

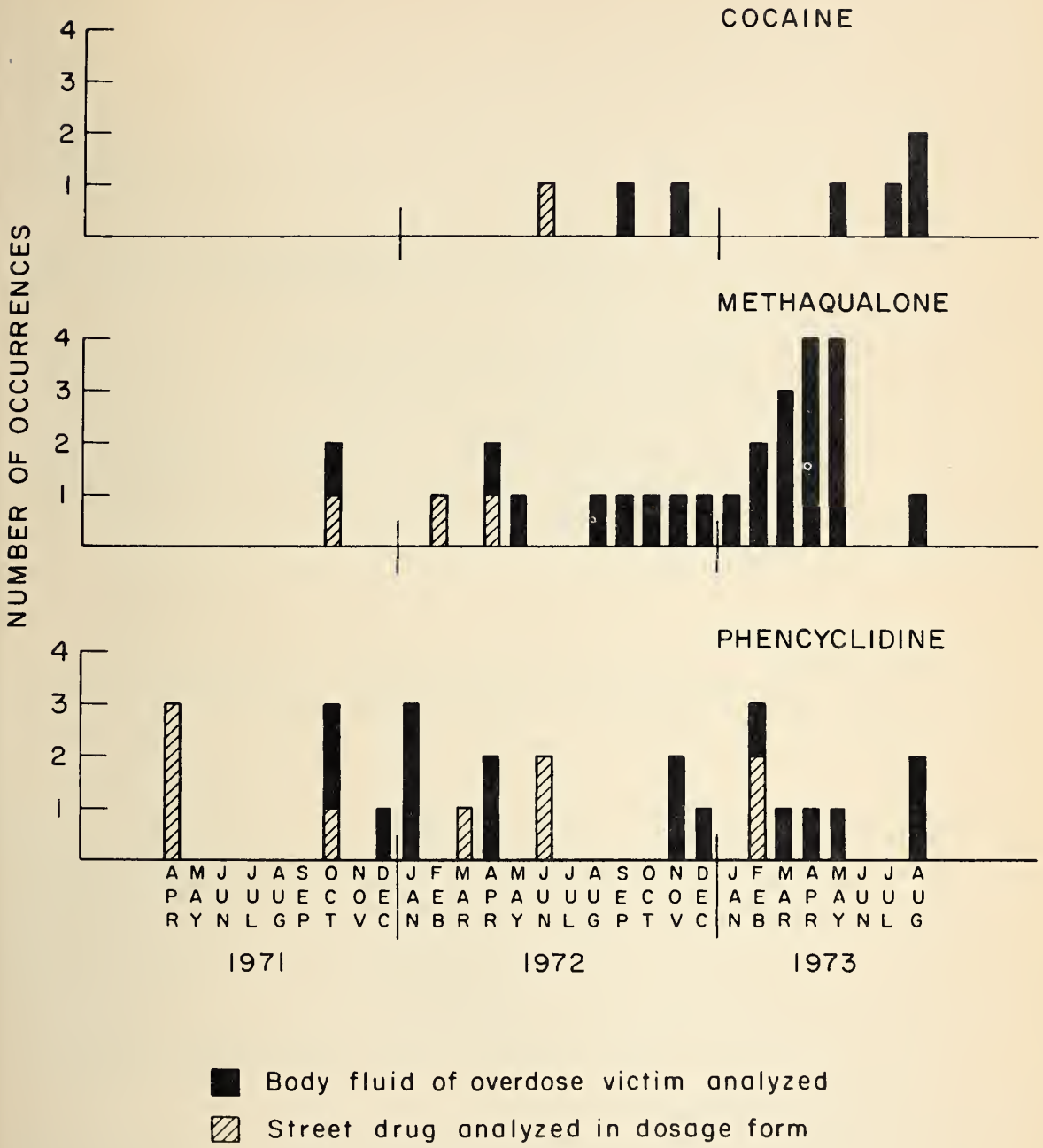
COCAINE
METHAQUALONE
PHENCYCLIDINE
NUMBER OF OCCURRENCES
4
3
2
1
A M J J A S O N D J F M A M J J A S O N D J F M A M J J A
P A U U U E C O E A E A P A U U U E C O E A E A P A U U U
R Y N L G P T V C N B R R Y N L G P T V C N B R R Y N L G
1971
1972
1973
Body fluid of overdose victim analyzed
Street drug analyzed in dosage form

Figure 7. *Frequency of identification of some street drugs among samples submitted to MIT for analysis.*

A more long-term result of the rather routine analysis of emergency cases over a fairly wide geographical area, such as greater Boston, is the accumulation of well-documented data on poisonings so that patterns of use can be noted some time before they might be apparent in an individual hospital. This is particularly important in the case of street drugs for which effects and recommended treatment may not be widely known. We have frequently been able to put doctors with patients who are suffering the effects of the same drugs in contact with one another so that they may exchange information on treatment. Documentation of this type of data also makes possible the publication of such information for general use and our program has resulted in at least one publication of this type (6).

We have also been able to furnish data to legislative agencies who are considering classification of drugs, such as methaqualone, whose abuse has led to much current interest in making it less easily available.

Our experience with drug analysis as described herein has led us to the conclusion that the gc/ms/computer system is a highly efficient means of dealing with the problem of rapid analysis necessitated by overdose situations and is also very useful for the problem, common to street drug analysis, of structure determination of unknown formulations. This type of analysis should also be effective in bettering the understanding of the pharmacological effects of these drugs as well as providing information useful for documenting patterns of drug abuse.

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Street Drug Information for Health Care Personnel. A Preliminary Report

J. A. Marshman[1] and K. Walther

INTRODUCTION

Since 1969 the Addiction Research Foundation (ARF), an agency of the Province of Ontario, has been involved in a program of street drug analysis. This activity was initiated as a research project in the belief that a knowledge of the chemicals actually available on the street is important for the appropriate interpretation of much sociological and clinical data and for the education of drug users and "helping" persons. The resulting data have made it evident that people in the Province of Ontario who acquire street drugs are frequently misinformed concerning the identity of these drugs (1, 2, 3), and this same general picture has emerged from the studies of other workers, both in North America (4-8), and in Europe (9, 10).

Continuing study has revealed only slight changes in the street drug pattern over time, for example, an apparent increase in the availability of cocaine and synthetic local anaesthetics being represented as cocaine, and the emergence of *p*-methoxyamphetamine (PMA) as a potentially lethal compound. Moreover, since samples examined in this (and most other) programs are unsolicited, there is no assurance that they are representative of the drugs available on the street. For these reasons the research value of such a continuing program is somewhat open to question. Hence, the orientation of this analytical involvement has gradually changed from research to service *i.e.* provision of an analytical service to the person(s) concerned about specific samples.

This type of service activity was recognized in the Interim Report of the Commission of Inquiry into the Non-Medical Use of Drugs (11) which recommended "that the

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Federal Government actively investigate the establishment of regional drug analysis laboratories at strategic points across the country" to provide "a psychotropic drug assay service". The commissioners concluded that "sample analysis and wide dissemination of the results can only serve in the long run to deglamourize drugs and drug-taking". Subsequent to this report amendments were made to the Narcotic Control Act (12) and the Food and Drugs Act (13) to permit a person to transmit a drug sample to a physician (or the authorized agent of a physician) for the purpose of identification or analysis. The specification of the physician as the required intermediary between the drug user and the analytical laboratory implicitly defines the role of street drug analysis in clinical terms, and contributes to a bias in submitted samples towards products associated with clinical problems. Moreover, the ultimate availability of information concerning the real composition of street drugs for the wide dissemination envisaged by the Commission is contingent upon the medical profession's willingness to accept this responsibility as the intermediary.

In view of the unique role conferred on physicians by this legislation, it seemed appropriate to determine what use was being made by physicians in the community of drug analysis results. To this end a brief questionnaire (14) was sent to all recipients of drug analysis reports during a limited time period, inquiring about the use which had been made of the analytical information. Many non-ARF physicians had submitted their samples through an ARF staff member and it was not possible to separate these samples from others which had originated with ARF staff; therefore only 28 responses could be attributed with certainty to non-ARF physicians. These are summarized in Table I.

TABLE I

USES OF STREET DRUG ANALYSIS RESULTS BY NON-ARF PHYSICIANS
(N = 28)

Use for Information		Number of Positive Responses
a)	To add to your general understanding of the drugs available in your community	13
b)	To gain further information concerning the drug-taking *behaviour* of a particular person under your care	17
c)	To provide a better basis for your decision concerning the *treatment* of a drug-related problem of a person who is (was) using this material	18
d)	To deal with the concern of the person who is (was) using this material	6
e)	To deal with the concern of a relative, spouse or friend of the person who is (was) using this material	11
f)	To influence the marketing or distribution of this material	2
g)	For some other reason	0
	TOTAL	67

As might be expected physicians used the analytical information extensively in the areas of diagnosis and treatment, and somewhat less frequently in dealing with the concerns of relatives and friends of drug users. However, it was interesting to note that almost half of the respondents felt that the information added to their general understanding of the drugs available in their community. This result suggested that there may exist deficiencies in the street drug information normally available to health care personnel.

Given the role of the physician in the clinical care of drug users, in an advisory capacity to the families and friends of users, and as the funnel for drug samples to laboratories (whether or not this is in the context of clinical care) it seemed appropriate to initiate a means for the regular dissemination of street drug information to health care personnel. This report is concerned with our initial attempts to provide such a service and to evaluate its utility.

ARF STREET DRUG NOTES – A NEWSLETTER

"ARF Street Drug Notes" is a newsletter designed to make accessible to concerned persons, primarily health care personnel in Ontario, information available to ARF concerning street drugs in current use. It was initiated in May 1973 as a trial project with publication on a monthly basis.

Format and Content of the Newsletter

Each issue contains three kinds of information: ARF laboratory results, a summary of the kinds of drugs found by a law enforcement laboratory network, and abstracts of relevant scientific literature.

ARF laboratory results for street drug samples examined during the preceding month are presented in tabular form, as shown in Table II. This format permits the reader to determine at a glance the kinds of drugs in circulation, the general appearance of their dosage forms, the area(s) of Ontario where they were found, any clinical effects reported, and their alleged composition. Drugs which have been found previously in the fiscal year, but not in the preceding month, are retained in the table with their cumulative totals.

While it may be argued that street drugs, like people, are subject to jet-age transport across provincial and international boundaries, it was decided generally to restrict reports from other laboratories to samples of Ontario origin since these are most likely to be seen by Ontario health care personnel. While this may seem a parochial approach, it is difficult to know just where to draw a line (e.g. provinces and states bordering on Ontario? Canada? Canada and the United States, possibly together with Mexico?), and if information is presented from the whole North American scene there is a risk that a single report of an "exotic" drug from some remote spot may cause unwarranted alarm in this area. To date, this section has presented data only from the laboratories of the Health Protection Branch, Health and Welfare, Canada – the kinds of drugs and the number of samples of each drug found during the most recent month for which data are available, together with a cumulative total for the fiscal year. Should the Health Protection Branch report finding a significant number of samples of a drug which has not yet appeared in Ontario, it is intended that this will be reported as a footnote, so as to alert recipients to the existence of that drug in Canada.

TABLE II

EXAMPLE OF TABULAR PRESENTATION OF ARF LABORATORY'S MONTHLY SUMMARY

Drug(s) Identified	Appearance of Sample(s)	Where Sample(s) Submitted From	Number of Sample(s) Last Month	Clinical Effects Reported (bracketed number indicates number of sample(s) for which a particular effect was reported)	Alleged Composition(s)	Number of Similar Sample(s) Since April 1, 1973
Cannabinoid(s)	Green powdered plant material Cigarette Spaghetti sauce	Toronto Orillia North Bay	3	Blurred vision (1) Psychotic reaction (1)	Cannabis (2)	14
LSD (lysergic acid diethylamide)	Tea (2) Brown square of gelatin (window-pane acid) Turquoise spots on blotter paper Brown powder in red capsule	Toronto (3) Kitchener Renfrew-Petawawa	5	Nausea and vomiting (1) Convulsion (2) Headache and dizziness (1)	LSD (3)	9
PCP (phencyclidine)	Small purple tablet	Toronto	1	Visual distortion (1)	LSD	9
MDA (methylene-dioxyamphetamine)	Beige powder in colorless capsule	Guelph	1		MDA	6
PMA (4-methoxy-amphetamine)	Beige powder	Willowdale	1	Nausea and vomiting Cramps Increased pulse rate and blood pressure	MDA	11

In an explanatory note contained in the first issue, it was pointed out that the Health Protection Branch laboratories examine drug samples in a context of law enforcement rather than in a clinical context. It seems important that this distinction be made since the bias inherent in these data is expected to be different to that in data from clinical laboratories. That is, one would expect that the Health Protection Branch data would show a lower frequency for a street drug whose possession is legal (at least under certain circumstances) than for a drug whose possession is illegal, even though the two drugs might exist with the same frequency on the street; on the other hand reports from a laboratory with a clinical orientation would be expected to show a bias towards clinical problem-causing samples. It would be highly desirable to include in this section results from other Ontario clinical laboratories, and it is hoped that these will be available in the future in order to provide a better perspective.

Because of its comprehensive library facility, ARF has ready access to many published reports which are likely to come less quickly to the attention of other health care personnel in the community. It therefore seemed desirable to include in this newsletter abstracts of relevant reports, primarily from the clinical literature, relating to street drug effects, toxicity, treatment, etc. In practice, the majority of the abstracts have been from reports published within the preceding 1-3 months, although a few have been published somewhat earlier. Furthermore, the reports have been restricted to those dealing with drugs encountered by this laboratory within the past few months. In one instance, when a "new" drug appeared on the street scene, a brief review of the relevant literature was presented, even though some of this literature was from earlier years. Generally, 4 to 6 abstracts have been presented in each issue.

Distribution of the Newsletter

In order to maximize the availability of the newsletter to health care personnel in Ontario, while at the same time maintaining a limited distribution compatible with the pilot project concept, a mailing list was devised based upon units in the health care delivery system rather than individuals on the registers of various professional licensing bodies. The composition of the mailing list at the end of the 4 month trial period is presented in Table III. (This is slightly different from that initially used since it reflects additions made by specific request of persons who were exposed to the newsletter through some other recipient).

In order to maximize the exposure of clinical staff to the newsletter, two copies of each issue were distributed to each general and psychiatric hospital in the province having more than 25 beds, with the exception of exclusively chronic care institutions. These were sent to the Director of Pharmacy (or, preferentially, to the Drug Information Pharmacist where this position was known to exist), with a request that one copy be kept in the drug information files and the second posted in a place where it would be readily accessible to the clinical staff, and each recipient was informed that additional copies of the newsletter were available on request. This approach was selected because hospital pharmacists normally serve in a drug information role for clinical staff, maintaining the necessary literature files. Additionally, in most major hospitals, the Pharmacy and Therapeutics Committee prepares a newsletter or bulletin, or in some other way provides clinical staff with necessary drug-related information, and it was anticipated that this could serve as a vehicle to make staff aware of the existence of "ARF Street Drug Notes".

Where no pharmacist was employed in the hospital, the newsletter was directed to the Chief of Medical Staff or the President of the Medical Staff Association.

Because of the changing patterns in health care delivery, it was considered important to include in the mailing list some non-conventional health care facilities such as neighbourhood clinics and mental health clinics, since many patients are being seen in such facilities who would formerly have attended out-patient clinics or been cared for by physicians in private community practice. Additionally, Medical Officers of Health were included because of their special concern with the epidemiology of public health problems and because of their relative isolation from clinical facilities.

TABLE III

NATURE OF ONTARIO NEWSLETTER RECIPIENTS

Nature of Recipient	Number of Recipients
General and psychiatric hospitals in Ontario (usually Pharmacy department)	196
Clinical service agencies (e.g. mental health clinics, neighbourhood clinics)	18
Medical Officers of Health	44
Clinical staff on specific services at 5 selected hospitals	151
Addiction Research Foundation staff (other than those attached to the ARF Clinical Institute)	47
Law enforcement personnel	50
Other (including government, drug information sources, educators)	16
TOTAL	522

While it was hoped that clinicians in many hospitals would become familiar with the newsletter by way of the hospital pharmacies, special arrangements were made to distribute individual copies of the newsletter to clinical staff in the areas of psychiatry, family practice, and emergency services in 5 hospitals. These hospitals were selected to be representative of various geographical areas of Ontario as follows:

- a major teaching general hospital in Metropolitan Toronto (1229 beds)
- the Clinical Institute of the Addiction Research Foundation, a teaching hospital in Toronto (80 beds)
- a general hospital on the periphery of Metropolitan Toronto (126 beds)
- a general hospital in a city of 50,000 located 75 miles from Toronto (502 beds)

— a psychiatric hospital (698 beds) and 2 general hospitals (total of 413 beds) in a city of 50,000 located in Northern Ontario

In each case the responsibility for distribution of the newsletter to these staff members was undertaken by the Director of Pharmacy of the hospital.

Once the initial issue had been distributed, various kinds of people who had seen a copy asked to have their names added to the mailing list. These included community pharmacists, persons in administrative roles in health care systems, and, unexpectedly, law enforcement officers, particularly "community service officers". Most of these requests were granted in the interests of community service, although each was informed that the publication was intended primarily for health care personnel, and might not serve the needs of other groups.

In all cases the first issue of the newsletter was accompanied by an introductory letter which set out the goals of the newsletter, its target population, and the fact that the recipient would be asked to assist in its evaluation by completing a questionnaire at the end of a trial period.

EVALUATION OF THE NEWSLETTER

The Questionnaire

A single page questionnaire designed for this evaluation was pretested with representatives of each of the professional groups, and a few slight changes were made. The final version, presented in Figure 1, was mailed approximately 1 week following the mailing of the fourth newsletter, together with a letter requesting the recipient's co-operation and assuring him/her of the anonymity of his/her response. The mailing list for the questionnaire was generally the same as the mailing list for the newsletter except that certain persons in administrative roles who had received the newsletter only for their general information, were excluded.

Response Rates

In Table IV is presented a summary of the questionnaire returns from a single mailing as they were received prior to an arbitary cut-off date (*i.e.* 6 weeks from date of mailing for physicians and 4 weeks for all others). The calculation of response rates is based on the return of questionnaires pre-marked with a code attributing them to a given group (e.g. Medical Officer of Health, hospital pharmacist). If a questionnaire was returned it was considered for purposes of calculating response rate as a response from the group designated by the code. However in a very few cases the questionnaire was completed by someone who reported his/her professsion as something different from the intended recipient; for example, in 2 cases "pharmacy" responses were returned by nurses whose responsibilities were in the area of hospital pharmaceutical services. These responses were included in "pharmacy" responses for purposes of response rate, but in "nurse" responses for analysis of the nature of the response. This is the reason for the small apparent discrepancies between the figures used for calculation of response rate and figures used as

FIGURE 1

EVALUATION QUESTIONNAIRE FOR "ARF STREET DRUG NOTES"

Please check the appropriate box(es) with an "x"

A. May we please have your views concerning "ARF Street Drug Notes".

1. Four issues of "ARF Street Drug Notes" have been distributed to date. To what extent have you read this newsletter? (Please check the **one** most accurate description)
   - 6☐ a) Did not look at any issue
   - ☐ b) Just glanced at some issue(s)
   - ☐ c) Generally looked only at some part(s) of the newsletter
   - 9☐ d) Generally read each issue through

2. Has this newsletter achieved **one or more** of the following results?
   - ☐ a) Made you more aware of the kinds of drugs available "on the street"
   - ☐ b) Made you more aware of the extent to which street drugs are misrepresented (i.e., contain some agent other than the drug(s) alleged to be present.)
   - 12☐ c) Increased your knowledge concerning the properties or effects of any of these drugs
   - ☐ d) Made no difference to your awareness or knowledge of street drugs
   - ☐ e) Had some effect other than those listed above (please specify)_____

3. Which of the following kinds of information concerning street drugs do you consider appropriate to your needs?
   - 15☐ a) The identity of drugs contained in "street" dosage forms
   - ☐ b) The physical appearance of "street" dosage forms
   - ☐ c) The kinds of drugs alleged to be available at the "user level"
   - 18☐ d) The kinds of drugs found by analysis to be present in police seizures
   - ☐ e) The properties and effects of specific drugs as reported in controlled experimental studies
   - ☐ f) Clinical reports concerning the effects of street drugs
   - 21☐ g) None of the above
   - ☐ h) Other (please specify)_____

4. Which **one** of the following recommendations reflects your view on the dissemination of such information?
   - ☐ a) Dissemination by publication of "ARF Street Drug Notes" on a monthly basis
   - 24☐ b) Dissemination by publication of "ARF Street Drug Notes" less frequently than monthly
   - ☐ c) Dissemination by including this information in some other type of publication. Please check the **one** publication you would consider most appropriate.
     - ☐ "The Journal" (published by ARF)
     - 27☐ "Addictions" (published by ARF)
     - ☐ "R_x Bulletin" (published by the Health Protection Branch)
     - ☐ A new publication of the Health Protection Branch directed to non-medical drug use
     - 30☐ A medical journal (please suggest an appropriate journal)
     - ☐ Other (please specify)_____
   - 32☐ d) Dissemination of such information is unnecessary

B. Please describe your professional activities

5. Are you a
   - ☐ Physician?
   - ☐ Nurse-practitioner?
   - 35☐ Nurse?
   - ☐ Pharmacist?
   - ☐ Social Worker?
   - 38☐ Other? (please specify)_____

6. What is the (major) area of your professional practice?
   - 39☐ Psychiatry
   - ☐ Emergency
   - ☐ Family practice
   - 42☐ Public health
   - ☐ Drug information services
   - 44☐ Other (please specify) _____

7. In which of the following setting(s) do you carry out your activities (check **one or more** answers as required)
   - 45☐ a) Hospital (other than ARF Clinical Institute)
   - ☐ b) Private community practice
   - ☐ c) Community clinical facility (other than a hospital or ARF)
   - 48☐ d) Community resource centre other than ARF (e.g., drop-in centre, crisis intervention centre)
   - ☐ e) ARF Clinical Institute
   - ☐ f) ARF other than Clinical Institute
   - 51☐ g) Other (please specify)_____

8. Which of the following services have you been requested to provide within the past 6 months? (more than one answer may be checked)
   - ☐ a) Medical treatment for problems associated with non-medical drug use
   - 53☐ b) Care other than medical treatment for problems associated with non-medical drug use (e.g., counselling, social services, etc.)
   - ☐ c) Provision of information concerning drugs in non-medical use. Please indicate who requested such information.
     - 55☐ Patients
     - ☐ Families or friends of patients
     - ☐ Health care professionals and/or paraprofessionals
     - 58☐ Schools, teachers
     - ☐ Others

9. Which of the following publications do you regularly read?
   - 60☐ a) "Addictions" (published by ARF)
   - ☐ b) " The Journal" (published by ARF)
   - ☐ c) "R_x Bulletin"
   - 63☐ d) None of the above

If you have any additional comments, criticisms, or suggestions, we would be happy to receive them. You may wish to include them on the back.

Thank you for your co-operation.

respondent populations for given professional areas. The response rates ranged from 55 per cent for law enforcement officers to 90 per cent for nurses, and it is anticipated that these rates will be increased when a second questionnaire mailing to non-respondents has been completed.

TABLE IV

QUESTIONNAIRE RESPONSE FROM VARIOUS PROFESSIONS

Respondent Group	No. Questionnaires Distributed	No. Questionnaires Returned	% Response
Physicians	199	110	55.3
Pharmacy Department	169	109	64.4
Nurses and Nurse Practitioners	20	18	90
Law Enforcement Officers	42	23	55
ARF Staff[a]	31	23	74
TOTAL	461	283	61.4

[a]Excluding staff of the Clinical Institute and other staff physicians who are included in their respective professional groups.

For purposes of this paper, only the responses of the total population, and the two largest health-care professional groups will be analyzed, since these should provide the most useful information. It would seem reasonable that ARF staff response (as well as that of the nurse-nurse practitioner group which includes some ARF staff members) may reflect a unique area of practice, rather than typical community practice; moreover, law enforcement officers are excluded because they do not constitute a primary target group and were added to the mailing list at their own request.

Readership Rates for the Newsletter

It seems reasonable that one measure of the utility of the newsletter would be the extent to which it was read by the recipients. Since "read" has various connotations an attempt was made to better define the exposure of the recipients to the contents of the newsletter. Therefore question 1 asked the following:

> To what extent have you read this newsletter? (Please check the *one* most accurate description)
>
> A. Did not look at any issue
>
> B. Just glanced at some issue(s)

C. Generally looked only at some part(s) of the newsletter

D. Generally read each issue through

From the responses to this question, summarized in Table V, it is apparent that the majority of all groups (281 out of a total population of 325 or 86.5%) did more than just glance at some issue(s). On the basis of their professional roles, one would expect that most of these respondents would be relatively busy persons with heavy reading obligations, and their reading of this newsletter suggests that it was in some way relevant to their information needs. Moreover, the data indicate that there is a valid base for answers to a subsequent question relating to the impact of the newsletter (*i.e.* only if a respondent has read the material can he/she make any meaningful comment upon what the newsletter achieved for him/her, except of course to say it had no effect).

TABLE V

EXTENT TO WHICH "ARF STREET DRUG NOTES" WAS READ BY RESPONDENTS

Respondent Group (N)	Extent of Reading			
	None	Glanced	Looked at Some Parts	Read Through
Total Population (325)	6	38	102	179
Physicians (106)	6	20	43	37
Pharmacists (106)	0	6	25	75

TABLE VI

EXTENT TO WHICH "ARF STREET DRUG NOTES" WAS READ BY PHYSICIAN SUB-POPULATIONS (By Specialty Area)

Respondent Group (N)	Extent of Reading			
	None	Glanced	Looked at Some Parts	Read Through
ARF (8)	0	1	1	6
Non-ARF Total (98) including	6	19	42	31
Psychiatry (15)	0	1	7	7
Emergency (2)	0	1	1	0
Family Practice (40)	2	11	19	8
Public Health (27)	1	3	8	15

Since the group "physicians" includes some ARF staff members, as well as various major practice areas, it seemed appropriate to consider the various physician sub-populations. The answers to question 1 for various practice areas are presented in Table VI. While it might be expected that ARF staff physician response would be different from that of other physicians in the community, it is evident from these data that the ARF staff component of the physician population is so small (8 out of 106) that it should not introduce substantial bias into the general physician picture. Consideration of non-ARF physicians confirms the finding for the total physician population since 73 out of a total of 98 such respondents or 74 per cent did more than just glance at some issues(s). Inspection of the responses for the sub-populations indicates that physicians in each of the four areas of practice generally read at least parts of the newsletter.

In addition to classification of non-ARF physicians by their specialty area, it was of interest to determine whether the setting in which they conducted their activities had any bearing on their reading of the newsletter. A summary of these data are presented in Table VII, and suggests that professional practice setting made little difference to the extent to which physicians read the newsletter.

TABLE VII

EXTENT TO WHICH "ARF STREET DRUG NOTES" WAS READ BY NON-ARF PHYSICIAN SUB-POPULATIONS
(By Practice Setting)

Respondent Group (N)	Extent of Reading			
	None	Glanced	Looked at Some Parts	Read Through
Hospital only (21)	0	3	12	6
Hospital and private community practice and/or community clinical facility other than hospital (28)	0	8	13	7
Private community practice and/or community clinical facility other than hospital (50)	3	12	25	10
Community resource centre other than ARF (3)	0	0	1	2

Finally, it was of interest to determine whether the geographical location of the physician's professional activity was a factor. A summary of the responses for non-ARF physicians is presented in Table VIII. It would appear from these data that the reading pattern is relatively consistent, regardless of geographical area.

TABLE VIII

EXTENT TO WHICH "ARF STREET DRUG NOTES" WAS READ BY NON-ARF PHYSICIAN SUB-POPULATIONS
(By Geographical Area)

Respondent Group (N)	Extent of Reading			
	None	Glanced	Looked at Some Parts	Read Through
Metropolitan Toronto and periphery (28)	0	8	14	6
Southern Ontario Selected City (27)	2	8	14	3
Northern Ontario Selected City (3)	0	0	1	2
Other Ontario areas (38)	2	3	13	20

In summary, it appears that neither the geographical setting of a physician's practice, nor the nature of that professional practice profoundly affected the extent to which a physician read this newsletter. Overall this publication appears to have been well received by health care personnel in various areas of practice throughout Ontario.

WHAT DID THE NEWSLETTER ACHIEVE FOR ITS READERS?

In order to determine the impact which the newsletter had on its readers, the following question was asked:

"Has this newsletter achieved *one or more* of the following results?
A. Made you more aware of the kinds of drugs available "on the street"
B. Made you more aware of the extent to which street drugs are misrepresented (*i.e.* contain some agent other than the drug(s) alleged to be present)
C. Increased your knowledge concerning the properties or effects of any of these drugs
D. Made no difference to your awareness or knowledge of street drugs
E. Had some effect other than those listed above (Please specify)"

A summary of the answers to this question from the various respondent groups is presented in Tables IX and X. The N value for each respondent group is the total population for that group minus those who reported that they did not look at any issue of the newsletter (*i.e.* non-readers were eliminated here since the newsletter obviously could have no impact for them).

TABLE IX

IMPACT OF "ARF STREET DRUG NOTES" ON RESPONDENTS

Respondent Group (N)	Number of Positive Responses: Awareness of Kinds of Drugs	Awareness of Misrepresentation	Awareness of Properties & Effects	No Difference	Other
Total Population (319)	203	174	154	24	24
Physicians (100)	60	55	38	14	3
Pharmacists (106)	79	66	51	2	11

TABLE X

IMPACT OF "ARF STREET DRUG NOTES" ON VARIOUS PHYSICIAN SUB-POPULATIONS (By Specialty Area)

Respondent Group (N)	Number of Positive Responses: Awareness of Kinds of Drugs	Awareness of Misrepresentation	Awareness of Properties & Effects	No Difference	Other
ARF (8)	1	2	5	3	1
Non-ARF Total (92) including	59	53	33	11	2
Psychiatry (15)	8	10	7	0	1
Emergency (2)	1	0	0	1	0
Family Practice (38)	21	21	12	6	0
Public Health (26)	22	18	10	2	1

It is apparent from these data that only a small number of respondents found that the newsletter made no difference to their awareness or knowledge of street drugs (24 of a total population of 319, or 7.5%). Therefore, the newsletter appears to have achieved its educational objective with respect to increasing the knowledge of its recipients concerning the kinds of drugs available on the street, their misrepresentation, and their properties and effects. If one accepts the hypothesis that increased knowledge among health care personnel concerning street drugs should assist them to intervene more efficiently in drug-related problems, then it would appear that the dissemination of street drug information to such persons is an important facet of the educational function of institutions such as the Addiction Research Foundation.

Respondent Information Needs

While the preceding question responses permit some inference about the information needs of the respondents, a more direct approach was also taken by asking the following question:

> Which of the following kinds of information concerning street drugs do you consider appropriate to your needs? (More than one answer may be checked).
>
> A. The identity of drugs contained in "street" dosage forms
>
> B. The physical appearance of "street" dosage forms
>
> C. The kinds of drugs alleged to be available at the "user level"
>
> D. The kinds of drugs found by analysis to be present in police seizures
>
> E. The properties and effects of specific drugs as reported in controlled experimental studies
>
> F. Clinical reports concerning the effects of street drugs
>
> G. None of the above
>
> H. Other (please specify)

The responses to this question are summarized in Tables XI and XII.

As might be expected from the answers in the preceding section the vast majority of respondents (95% of the total population, 94% of physicians, and 95% of pharmacists) expressed a need for street drug-related information, and few (less than 6%) desired any type of information other than the specific choices given in the questionnaire.

The total respondent population, as well as the physician population and sub-populations indicated their major information needs to be in the areas of the drugs alleged to be on the street, the actual identity of these drugs, and clinical reports of their effects. Physical appearance was somewhat less important, followed by drug properties and effects, and finally police seizure reports. Pharmacists differed only slightly, ranking physical appearance and police seizure information somewhat higher.

It is interesting that "properties and effects of specific drugs as reported in controlled experimental studies" is ranked relatively low, since one might expect that the drug effects reported in such studies would be those basic to the pharmacologic agent, relatively uncomplicated by "set" and "setting" and therefore would be those encountered by clinical personnel as a "common denominator" in the clinical pictures presented to them. It is possible that the value of such reports is downgraded by the respondents for one or more of the following reasons:

1. Because they are recognized as being relatively uncomplicated by "set" and "setting", the properties and effects reported in such studies may not be thought to resemble the effects shown by a patient with whom the clinician might be asked to deal in the "real world".

2. There may be recognition that "street drugs" sometimes contain more than one drug, or one drug plus impurities, and that the effects of such combinations are likely to be quite different to those reported for a single pure drug studied in a laboratory.

TABLE XI

INFORMATION NEEDS OF RESPONDENTS

Respondent Group (N)	Frequency of Responses							
	Identity of Drugs	Physical Appearance of Drugs	Alleged Drugs	Police Seizures	Drug Properties & Effects	Clinical Reports	None of Preceding	Other
Total Population (325)	172	154	185	102	117	183	14	12
Physicians (105)	49	40	60	32	38	60	6	3
Pharmacists (107)	66	60	54	40	34	60	5	6

TABLE XII

INFORMATION NEEDS OF PHYSICIAN SUB-POPULATIONS
(By Specialty Areas)

Respondent Group (N)	Frequency of Responses							
	Identity of Drugs	Physical Appearance of Drugs	Alleged Drugs	Police Seizures	Drug Properties & Effects	Clinical Reports	None of Preceding	Other
ARF (8)	3	2	5	3	6	5	1	0
Non-ARF Total (97)	46	38	55	29	32	55	5	3
including								
Psychiatry (15)	8	8	9	2	5	10	1	0
Emergency (2)	1	2	1	1	0	2	0	1
Family (40) Practice	17	14	19	9	14	22	3	1
Public (27) Health	16	12	20	12	7	12	0	0

Alternatively it may be recognized that relatively small "safe" doses are usually administered in laboratory studies, while much larger "toxic" doses are seen by the clinician, and the characteristics of the clinical pictures may be vastly different.

3. Respondents may consider that they are already familiar with the "textbook" properties of these drugs or can readily find that information, and have little need for further information.

4. There may be a widespread belief that a knowledge of the properties and effects of these drugs is not really useful to health care personnel since treatment tends to be symptomatic and not drug-specific, and therefore a knowledge of the causative agent is not essential.

On the basis of the responses it may be concluded that the newsletter has been providing most of the kinds of information which are considered to be necessary (*i.e.* information concerning alleged drugs, actual identity, physical appearance, and police seizures, with limited reports on drug properties and effects). It would seem therefore that this publication has been filling an information need for health care personnel.

However, there is one obvious deficiency in the newsletter which reflects a deficiency in the scientific and clinical literature, namely, an absence of clinical reports concerning cases involving street drugs. There may be many factors which contribute to this situation, including the following:

1. In most "street drug" treatment situations the clinician's knowledge of the identity of the causative agent(s) is that provided by the patient or the patient's associates, and because mis-identification of street drugs is common, the clinician may be reluctant to write up case reports unless he has laboratory confirmation of the drug's identity (and such laboratory services are not widely available).

2. The average clinician encounters a relatively small number of cases in which a particular drug is thought to be the causative agent, and the clinician (or journal editors) may consider that single case reports are not worthy of publication.

3. Because of limited investigation of appropriate treatment modalities for clinical problems arising from street drug ingestion, the clinical personnel may have little to report by way of rational and decisive intervention in the cases they meet, and are reluctant to produce a report which is dominated by a description of the clinical state in the absence of "appropriate" treatment.

In view of the need for clinical reports expressed by the respondents it would seem important to encourage such reporting. In order to overcome the first point noted above (*i.e.* paucity of drug identification laboratories) it would seem desirable to encourage laboratories associated with large clinical facilities to extend their toxicological services to include "street drugs" both in dosage forms and in blood and urine. If the cost-benefit picture for large numbers of laboratories is highly negative then regionalization of such service would probably suffice. (Certainly if the physician wants the analysis report for purposes of writing a case report a delay of a week would be inconsequential).

The question of lack of rational treatment approaches (point 3 above) reflects the need for research in this area. Efforts should be directed toward controlled prospective studies as well as retrospective analysis of treatment approaches used in well documented cases. This need for documentation, in spite of the limitations of the small numbers of cases seen by individual clinicians or clinical facilities, may be overcome by some form of centralized reporting along the principles used in nationwide adverse drug reaction reporting programs in order to permit the accumulation of data from a large number of cases. However, such a system would be useful to clinicians only if the centralized agency had

well qualified staff members who were competent to analyze the reports critically and prepare reliable and detailed composite clinical reports, since it would be utterly useless to generate reports giving only the relative frequencies of "poisoning" by various drugs.

PUBLICATION OF STREET DRUG INFORMATION

Since all respondent groups expressed a need for information concerning street drugs, it seems important to consider appropriate means for the dissemination of such information. Although the preceding question responses suggested that "ARF Street Drug Notes" was a relatively useful publication for its specific target groups it does constitute an additional piece of mail to be read and it seemed important to determine whether respondents would prefer presentation of this information in some existing publication or with a different frequency. Therefore the following question was asked:

> Which *one* of the following recommendations reflects your view on the dissemination of such information?
>
> A. Dissemination by publication of "ARF Street Drug Notes" on a monthly basis
>
> B. Dissemination by publication of "ARF Street Drug Notes" less frequently than monthly
>
> C. Dissemination by including this information in some other type of publication. Please check the *one* publication you would consider most appropriate:
>
> — "The Journal" (published by ARF)
>
> — "Addictions" (published by ARF)
>
> — "℞ Bulletin" (published by the Health Protection Branch)
>
> — A publication of the Health Protection Branch directed to non-medical drug use
>
> — A medical journal (Please suggest an appropriate journal)
>
> — Other
>
> D. Dissemination of such information is unnecessary.

A summary of the responses to this question is presented in Table XIII. The responses overwhelmingly support the principle that such information ought to be made available to health care personnel (only 5 of the total 325 respondents considered this unnecessary), and in the total and physician populations there was a marginal preference for continued publication of ARF Street Drug Notes as an appropriate vehicle while pharmacists marginally preferred some other type of publication. Of the total and pharmacist populations those who supported continued publication of this newsletter favoured publication on a monthly basis while physician opinion was equally divided between monthly and less frequent publication. This may reflect the fact that physicians are deluged with literature and find it more difficult to find reading time, or they may

consider that there is not sufficient change in the information available from month to month to justify monthly publication.

Among the alternate publication choices, other ARF publications (*Addictions*[2] and *The Journal*[3]) and ℞ *Bulletin*[4] were chosen most frequently by the total population. However, it is obvious that pharmacists account for the vast majority of the "℞ *Bulletin*" selections (52 out of a total of 67), and this is understandable since 95 per cent of pharmacists reported reading ℞ *Bulletin* as compared with only 55 per cent of the total population and 58 per cent of physicians. It appears, therefore, that pharmacists are expressing a desire to have street drug information included in a publication which they already read on a regular basis. By way of contrast, physicians selected as major alternate publications *Addictions*, *The Journal* and ℞ *Bulletin*, to the extent of 15, 10, and 8 per cent respectively, while their regular readership of these publications was reported as 41, 63, and 58 per cent.

TABLE XIII

RESPONDENTS' VIEWS CONCERNING APPROPRIATE VEHICLES FOR DISSEMINATION OF STREET DRUG INFORMATION

Frequency of Positive Responses[a]	Respondent Group (N)		
	Total Population (325)	Physicians (105)	Pharmacists (107)
ARF Street Drug Notes — Total	200	59	63
Monthly	138	30	45
Less frequently than monthly	62	29	18
Some Other Publication— Total	165	49	71
Other ARF Publications	71	27	11
℞ Bulletin	67	8	52
Federal Publication re: non-medical use of drugs	14	2	8
Medical Journal	21	14	6
Other	9	1	5
Dissemination Unnecessary	5	0	2

[a] Some respondents selected more than one answer; therefore the total number of responses exceeds the population N

[2] *Addictions* is a quarterly journal published by ARF, and directed primarily to people engaged in research, treatment or education in the field of alcoholism and drug dependence.

[3] *The Journal* is a monthly newspaper of ARF directed primarily to professional groups and reporting recent developments in the drug and alcohol field.

[4] ℞ *Bulletin* is a bi-monthly journal, published by the Health Protection Branch, Health and Welfare Canada. It provides information concerning primarily drugs in medical use—including changes in regulations governing their use, monographs of new drugs, notices of adverse reactions, and compilations concerning quality and price.

In summary then, the respondent population overwhelmingly supported the continued dissemination of street drug information to health care personnel, and ARF Street Drug Notes was selected with greater frequency than any other single publication by the total population and by the individual respondent groups. This suggests then, that there is a real role for a newsletter which directs itself to this area exclusively. However, it should also be considered whether a regular contribution of such information would be appropriate for more general publications which might already be regularly read by specific groups.

Functions of Respondents re: Non-Medical Drug Use

It is evident from the preceding sections that health care personnel in Ontario acknowledge a need for information in the area of drugs in non-medical use. This is hardly surprising since many other segments of our society seem to be eager recipients of pamphlets, brochures, fact sheets, press reports, and other vehicles of information on this subject. The question is, then, whether the information needs of health care personnel relate directly to their professional functions in this area or whether they are of a more general nature. In an attempt to shed some light on this subject, the following question was asked:

> Which of the following services have you been requested to provide within the past 6 months? (More than one answer may be checked)
>
> A. Medical treatment for problems associated with non-medical drug use
>
> B. Care other than medical treatment for problems associated with non-medical drug use (e.g. counselling, social services, etc.)
>
> C. Provision of information concerning drugs in non-medical use. Please indicate who requested such information
> — patients
> — families or friends of patients
> — health care professionals and/or paraprofessionals
> — schools, teachers
> — others

The response data for this question is summarized in Table XIV. Because of the nature of the question it does not seem appropriate to consider total population response, or responses from ARF staff members but to deal only with non-ARF physicians and pharmacists. It is interesting that approximately one-half of non-ARF physicians have been requested to provide medical treatment and other kinds of care for problems associated with non-medical drug use, as well as information about the drugs themselves. Therefore the physician's expressed need for street drug information would appear to be generated by his specific professional activities. However, it may be argued that it would be those physicians who have been requested to provide such services who would take the trouble to respond to a questionnaire in this subject area. Since, in replying to the question on their information needs, 94 per cent of physicians indicated a need for some kind of street drug information, yet a somewhat smaller number have actually been requested to provide related services, one can conclude that many "non-treating" physicians are interested in becoming better informed in this area; whether they are simply

interested citizens, or whether they anticipate the possibility that they may be asked to provide specific services in the future remains a question. From this table it is apparent that physicians are receiving drug information requests from a wide variety of people, rather than just patients and relatives of patients. It seems reasonable that this may reflect the community's expectation that physicians are a primary information resource in this area.

TABLE XIV

FUNCTIONS OF NON-ARF RESPONDENTS
RELATING TO NON-MEDICAL DRUG USE

Frequency of Positive Responses	Respondent Group (N)	
	Physicians (97)	Pharmacists (105)
Medical Treatment	49	13
Care Other than Medical Treatment	48	2
Drug Information Total to:	51	69
Patients	29	10
Patient Relatives, Friends	31	20
Health Care Personnel	29	57
Schools	28	18
Others	7	13

As might be expected, hospital pharmacists find their main function in the area of drug information (69 of 105 or 66%), with a majority (55 of 105) receiving such requests from health care personnel. These data suggest that the hospital pharmacy is being asked to function as an information resource for health care personnel in the area of drugs in non-medical use. Whether it can fulfil this role will depend in part upon whether appropriate information is available.

Given this overall response, it is interesting to consider the response of individual physician sub-groups. From Table XV it is apparent that both psychiatrists and family practitioners face demands for all three types of involvement, while for public health physicians the emphasis is on provision of drug information and care other than medical treatment.

TABLE XV

FUNCTIONS OF NON-ARF PHYSICIANS
(By area of practice)

Respondent Group (N)	Frequency of Positive Responses: Medical Treatment	Other Care	Drug Information
Psychiatry (15)	9	12	7
Emergency Services (2)	2	1	—
Family Practice (40)	26	18	18
Public Health (27)	3	16	23

One final consideration is the nature of services requested as a function of geographical distribution as considered in Table XVI. It is obvious from these data that a substantial proportion of physicians throughout the province are being asked to provide all three types of services listed; this certainly argues against the often heard remark that outside of a few large urban centres in Ontario, health care personnel are not concerned with problems of non-medical use of drugs.

TABLE XVI

FUNCTIONS OF NON-ARF PHYSICIANS AND PHARMACISTS
(By geographical area)

Respondent Group (N)	Frequency of Positive Responses: Medical Treatment	Other Care	Drug Information
Physicians			
Metropolitan Toronto and periphery (28)	14	13	13
Southern Ontario Selected City (27)	21	13	12
Northern Ontario Selected City (3)	1	2	1
Other Ontario Areas (38)	13	21	26
Hospital Pharmacists			
Metro Toronto (18)	2	0	10
Other Ontario (87)	11	2	59

CONCLUSION

Analysis of the questionnaire responses from recipients of "ARF Street Drug Notes" has revealed that health care personnel in Ontario need various kinds of street drug information which pertain to their professional involvement in treatment, care, and drug information functions. Moreover, when such information is provided to them by way of a newsletter it is read, and appears to have an impact on their awareness of various facets of the street drug situation.

Provision of this information would seem to be a necessary part of the continuing education of health care personnel. Should it be provided as a separate publication concerned with non-medical use of drugs, or should it be integrated into existing professional publications? The former mechanism means an additional unit of reading material for the already busy practitioner, while the latter may mean duplication of efforts to ensure that the appropriate material reaches all the necessary disciplines, but with the option of a better information selection process for specific groups. Possibly if a government-sponsored centralized information service were provided to appropriate health care journal editors, it might be possible to optimize the availability of appropriate information to all groups, with the choice of emphasis and mode of presentation left with respresentatives of the individual groups.

One apparent deficiency in the currently available literature is in the area of clinical reports of street drug adverse reactions, and a number of possible reasons have been suggested for this situation. It has been suggested that a nationwide street drug adverse reaction reporting system would be highly desirable, particularly if it were coupled with an information dissemination system as suggested above. The efficacy of such a system would depend, however, upon the co-operation and participation of the health care personnel throughout the country in reporting appropriate information. Moreover, an adequate network of laboratory facilities for analysis of street drugs in dosage forms, and in biological fluids, would be a prerequisite for such a reporting system.

Finally, it should be emphasized that this report has been concerned primarily with the conventional hospital-based health care delivery units and the traditional health care professions. It is important to recognize the increasing role of paraprofessionals in intervention in street drug-related problems, and to consider the needs of these groups in the development of information systems.

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COMMENTS FROM CLINICIANS

Dr. Leo Hollister[1]

My major qualification for appearing at this meeting is that in 1968, at a meeting sponsored by the U.S. Bureau of Narcotics and Dangerous Drugs, I publicly announced that I thought the drug law we needed most in the United States was a "Pure Street Drug Law". The circumstances then under which people were dosing themselves with medications of unknown quantity and quality were appalling. This statement had a salutary effect. At that time I was a member of the Scientific Advisory Committee of that body. Soon, notices of succeeding meetings of the committee arrived on the Tuesday before the Friday that they were to be convened in Washington, so that I consistently missed them. The committee was subsequently dissolved, or at least I haven't heard from them since.

At the time that I made this suggestion I really didn't have a clear idea of what kind of law we might have and I still don't; but from hearing what I have heard here today it would seem to me that there might be four basic principles that could be embodied in such a law:

1. Users have a right to know what they are taking and how much they're getting. This right applies to licit drugs and is equally appropriate for illicit drugs.

2. The government has responsibility to protect people from injury even if it considers they are doing something foolish. What is one man's folly may be another man's hobby.

3. Both criminal and civil sanctions should be applied to those who purvey drugs containing obviously injurious substances, regardless of the intent. Whether the toxic materials were added accidently or, as has often been the case, deliberately, should make no difference.

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4. The user should be educated in sterile injection techniques and furnished supplies to accomplish this. As we've often pointed out in this discussion, many of the complications of drug-taking stem not so much from chemical impurities as from microbiological impurities.

Now, in that broad context, what are street drug programs accomplishing right at the present time? From a consumer's point of view they may be educational; that is, if we know what is on the market we can let the consumer know what he's getting. We have heard some disturbing evidence that education isn't so easily accomplished. Apparently the faith that drug-takers have in their dealers is about the same as the faith that patients often have in their healers. It's a kind of blind faith that is often not amenable to logic or scientific evidence. This state of affairs is further compounded by the fact that many studies suggest that the drug-using population is a highly mystical one. They have strong beliefs in magic and supernatural powers: astrology, tarot readings, I Ching casting and the like. So they may be refractory to the usual kinds of educative processes. And finally, (I hesitate to say this but it is one of the most disturbing aspects of this group of people) they tend early to develop prejudices which remain fixed; they are extremely inflexible.

A second function that street drug analysis may have for the consumer is to protect him against clearly toxic contaminants — no matter how they get there — and perhaps also against overdoses. This has been valuable in regard to heroin, where concentrations may fluctuate very widely over a short period of time. Without knowledge that a stronger-than-usual material may have appeared on the market, the user runs a risk of overdose. We've mentioned quality control, which is more important to the consumer than to the vendor. It puts some pressure on vendors to put out a more precise product.

How does it benefit the therapist, using the broader sense of the term to include all the people involved in drug abuse programs? Dr. Marshman has just told us of the problem of educating professionals in these matters. One can think of several gimmicks to use for such purposes — perhaps another page in the Journal might be appropriate. But we are deluged with paper; when I came back from a three week absence from my office recently about 20 lbs. of "throw away" journals, another 10 lbs. of first and second class mail, and about 5 lbs. of air mail awaited me. It may be unrealistic to think that people are going to read more papers, retain them and file them in accessible places. One possible solution would be to use the poison control model. A wide-area telephone network number that would allow people to call in with specific questions on a 24-hour-a-day, 7-day-a-week basis to obtain information about drugs of interest. Such a service should be available not only to professionals but also to citizens at large. Much information such as you have obtained here and from other expert sources would have to be digested and edited for computer memory. When an inquiry came in, in a matter of a few moments if not immediately (depending on how busy the lines were), a computer print-out could provide the needed information. I get such calls frequently. People will call up and ask "What is PCP?". They don't have the foggiest idea of what PCP is. Not long ago I got a call from someone at the Mayo clinic: "Will mescaline overdose produce acute hepatic necrosis?" So far as I know it doesn't. I suggested instead one possibility of mushroom poisoning. This kind of question might be best answered by a service such as that described.

Another general value of street drug analysis might be for the identification of ingested drugs to assist the treatment of toxic or overdose reactions. I doubt that this information would alter treatment very often. Treatment of drug intoxications has become sort of empirical; that is, if patients are depressed you support them, and if they're

stimulated you sedate them. Just what the drug is becomes of less importance. A quantification of plasma concentrations might be very helpful in dealing with excessively strong street barbiturates, or an especially strong type of heroin. Treatment still would not be much affected as the clinical signs determine the course. It has become almost routine for anyone who comes in comatose with drug intoxication to get a dose of naloxone. An amelioration of coma produced by this antagonist may help prove an opiate overdose. Street drug analysis could be helpful in explaining unusual complications which might be due to impurities in the drug; for instance, the presence of talc in preparations might alert people to respiratory complications in heroin addicts who might be developing talc granulomas.

Still another area in which street drug analyses could be helpful would be what I would term the "epidemiology-enforcement" area. We've heard that street drug analyses provide some indications about patterns of use of drugs. It's interesting that Dr. Costello usually gets the tablet before she gets the patient, which may presage later clinical problems. However, while one might have predicted the emergence of cocaine as a widespread "new" drug of abuse in the last two or three years, one might have missed methaqualone as it comes clearly labelled, is usually from licit supplies that have been diverted and samples of this drug are seldom submitted. So limitations based on biased sampling still plague us. If one were to detect a new abused substance not under some current legal controls, such a finding might provide an indication for control. Until I heard today that barbital is also being used, it would not have occurred to me to control this substance. Information of this sort might provide the enforcement agencies with some clue about the appropriateness of applying new controls to certain substances.

Finally, from the investigative point of view, street drug analyses could provide tests to worthwhile practical studies. For instance, it was previously mentioned that the interaction between PCP and LSD in combination has never been studied. In fact, even the published literature on PCP is very scanty and generally applies to doses given intravenously rather than orally as it is commonly taken. A great gap in what we really know about the clinical pharmacology of PCP exists, especially in regard to its oral use or in combination with other drugs. Human experimental studies may be out of the question now, but animal studies are feasible and valuable. Continued analyses may lead to new and simple methods of analysis. A general tendency is to develop a new analysis with the most complicated and expensive equipment, but one always hopes that eventually one can improve extraction techniques which would permit adaptation to simpler detection methods, such as photometry, spectrophotometry or fluorometry. Some hospitals where drug detection is a major problem have set up a clinical toxicology screen which, while not highly accurate in terms of quantification, is not bad as far as identification is concerned. Street drug analysis might also suggest some ideas for prospective studies of potentially toxic by-products of manufacture. One would hope that as we come to know more about the metabolism of these drugs, investigations of the accumulation of toxic metabolites would be undertaken. This is a matter of great concern with some of the drugs, such as amphetamine.

There are many problems with street drug analysis and there are many limitations which I won't go into now. I just wanted to give you some idea of how, to a clinician, street drug analyses may have some values and some limitations. We have reached a kind of watershed point in this field. From now on we ought to think of new approaches to the analysis of street drugs. The present scattered efforts now need better coordination and better dissemination of the results to justify the continued expenditure of time, effort and money for this purpose.

Dr. L. P. Solursh[1]

My first comments will be directed toward those drugs that are on the street *de facto,* as confirmed by analyses but not necessarily contingent thereon. Whether in Canada or in the United States, the "on the street" drugs are known to vary in kind according to the geographic location in which they are found. In most instances the street buyer has a 50 per cent chance of getting what he thinks he is getting. There have been data to verify this for some time. It is based on the selective kind of sampling that has been going on: that is, if we can ascertain what the buyer thinks he was getting, we can draw the conclusion that there is a 50 per cent chance that that is what he got.

The emphasis in this country, and indeed in much of the United States, is on "downs"; that is, sedative-hypnotics — whether heroin, "barbs," diazepam or methaqualone. In some areas, such as Montreal, Dilaudid is being prescribed fairly widely by physicians who are running their own heroin addict treatment programs and are not permitted to use methadone. Dilaudid is becoming something of a street drug of abuse in the way that methadone was before government controls were brought in. That the use of cocaine has risen over the last year-and-a-half to two years is a generally accepted fact, but we don't see much of it for analysis because it simply costs too darn much (roughly $65.00 a gram) to bring samples of it in — and users don't tend to do so.

A point I would like to stress — one that was mentioned this morning — is that there are several populations of users. We commonly see a population of multi-drug abusers — or, as we called them years ago, chemically promiscuous persons who move from one drug to another or mix them up at different times. We certainly see this multi-drug use on

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the street; we see it reflected in "emerg." with people mixing several "downs," e.g. barbiturates and alcohol, with an hallucinogen thrown in sometimes, or a narcotic – and different drugs at different points in time. This is a common pattern but by no means the only one – as was mentioned this morning.

With respect to the size of the problem, for those of us working as clinicians I suspect we've decided it's not as big as it used to be – or else it doesn't bug us as much. One reason is that people are not running into difficulty with the drugs they are using; at least, they don't come to us for treatment. But United States surveys show that it's still the second or third leading public health concern – or public concern – so it's still somebody's concern! And then we do have statistics which provide some quantitative insights. One is the kind of statistics we've collected at the Toronto Western Hospital, which shows that of all the psychiatric consultations (not in emergency but in the general hospital, including aged people with depressions and so on) 50 per cent are for persons with significant psychoactive drug-related problems and fully half of those are with alcohol. That is still a pattern worth noting – and I don't think we can discount it. Federally, the Health and Welfare people have put out a series of probability tables for deaths in the next ten years which reflect current causes of death. If you look at males and females aged 15, 20, 25 and 30 years of age, motor vehicle accidents (of which we know half are related to alcohol and half at least of the remainder to other drugs) are consistently number one; suicide and self-inflicted injury are number two – and most of those are with drugs (and I would consider that drug misuse for the sake of argument). As you get to ages 30 and 35 there is an increase in cirrhosis of the liver, which is largely related to alcohol misuse and which creeps up quickly in importance in the higher age groups.

That's one indication of the magnitude of the problem: it's still there – maybe it bothers us a little less, but it certainly is killing a lot of people and it's bringing a lot of people into the general hospitals. I don't think we can ignore it. I think it is necessary that we get that fact established because, for instance, I keep asking myself whether or not we should continue our committee within the Canadian Medical Association.

With that background, what about street drug analyses? We have gone through several periods in this country. As doctors we have been through a period wherein we were not permitted, legally, to be in possession of these drugs for analytical purposes. Then, by a change in the regulations we were allowed to have them. There have been times when it has been useful – particularly in the broader sense that's been talked about already. I'll refer to two different kinds of incidents as examples.

For instance, there was the occasion when we couldn't get any analyses done although it was particularly relevant, not only to the legal aspects but also to the clinical direction of the person's care to know what he was pushing. He said it was saccharin, and did a neat little job on saccharin with a marking pencil. I was inclined to feel it was saccharin but the only way I could analyse it was to take a bite out of it. It tasted like saccharin – in fact, it was saccharin. But the interesting thing was that one of the nurses in the psychiatry department lifted a couple of these off my desk before I told her they were saccharin. She gave one to a friend and they both tripped promptly and merrily along!

Another example that some of you may know about is the one that originated in Rochdale a couple of years ago. The people there grabbed a bunch of something new – they didn't know what it was – and held it until we could get some analysis results. It was harmaline. I, for one, and for very obvious reasons, did not want a MAO inhibitor

floating around the street, being used in copious quantities. We did get rid of this batch of drugs and, it is said, some people put the boots to the dealers, who subsequently received their just rewards.

Atropine or strychnine have been known to exist on the street from time to time, but not very often. I remember one quadraplegic who was in dire shape because of a drug which we were able to prove was relatively pure atropine.

The question was raised this morning about whether high doses of LSD produced strychnine-like results. Although I am not going into a prolonged discussion about this I would remind you that we have had a considerable amount of clinical experience with LSD in known high doses. We have done studies ourselves using between 500 and 2,000 micrograms, for instance. In our experience LSD very rarely produces anything along the lines of strychnine effects.

There are various kinds of difficulties for the clinician. Over the years we've found that 50 per cent of the drugs are not as they are represented. We have discovered something else — I'll just mention it now and perhaps it will come up in discussion later — that is, there is sometimes disagreement between various labs; even when the same federal standards are used there is disparity. For instance, we sent samples for qualitative analysis to three qualified laboratories and received at least two different answers — sometimes three. This happened several times.

Frankly I think there is a downswing in the requests for analysis, less pressure. In my opinion the general information that would be useful to clinicians — what's around, what it looks like, and what the guy probably has, is the kind of thing that could be done within a couple of days and dispersed through appropriate routes and channels. Quite honestly, I suspect that the number of instances where body fluid analysis in an acute state are required are very few. To be of any use we would really require them within an hour or two. But the number of instances of somebody in that serious a state are relatively few, and I think we have to keep this in perspective. There, too, qualitative is much more important than quantitative analysis to us as clinicians.

Finally, I raise the question: what are our goals? Unless we can define these, I don't think we can talk about what we want to set up in the future. And I'll really raise a few questions there.

Are we talking about education and preventative programs? Are we talking about reducing misuse — or stopping all use? We really have to come down off the fence and decide what we're talking about. If we're talking about stopping all use I personally don't think that's practical. Insofar as we can accept that we're talking about reducing damage, reducing misuse, and accepting a degree of use, then we come down on the side of the fence that says there is some value to a quality control program — granting that this isn't the only aspect of why street drug analyses may be requested. But I think it's an important philosophical point, and I raise it for discussion rather than trying to settle it. To that extent the aspects of consumer protection that Leo discussed and the contributions made to management of patients are probably valid, and in my mind include aid from the police.

I think it's valid to enlist police support in finding out what's around when they pick up somebody who's in a rough state. We've had, at times, a great deal of cooperation from our police, who have undoubtedly been in a better position of knowing what's probably happening and being able to tell the clinical staff. So, from our point of view I would stress co-operation with the police, not for political reasons at all; for therapeutic reasons.

The question of legislative controls was brought up. I'm not going to try and settle that but I offer one thought in that area. The size of the problem is unclear. Governments don't react or else they over-react. They don't know what is really happening or to what extent it's a problem. If you do your analyses quickly and accurately, if you get hold of all kinds of samples through the police, doctors, users and dealers, then you tend to wind up with complete over-reaction on the part of government in the form of legislative controls. On the other hand, if you take your time and do it slowly you are presented with the phenomenon of the government chasing its tail because this is in fact a cyclic kind of phenomenon. We have seen cyclicity with all of these various drugs, including the legal ones that have been diverted. And to that extent, by the time government can exert any kind of adequate control measures, the problem has started on the downswing.

Personally, I tend to be a little pessimistic about government giving us the answer or, for that matter, our demanding an answer from the government. We're going to have to find another way, and insofar as this meeting points in that direction, I think it's probably valid.

SUMMARY OF THE SYMPOSIUM

Dr. Leo Hollister

It seems to me that one of the best book titles was that of Kenneth Clark's widely acclaimed publication, *Civilization,* he had the good sense to give it the sub-title "A Personal View". Any summary of a conference as wide-ranging as this one is bound to represent a highly personal view.

The conference got off to an appropriate international beginning by having the first three reports come from foreign countries, Germany, the U.S.A. (it is very difficult for me to think of it as a foreign country) and Holland. All three reports focused on similar aspects of street drug use which we eventually learned were somewhat common also to Canada. The major aspects presented were the following:

1. The same general pattern of drug use is found in each country, give or take transient variations in popularity of individual drugs, and in general is restricted to a relatively small number of widely used drugs.

2. Mislabelling of drugs is common, but even when other than the purported drugs are offered they are often appropriate (e.g. substitution of LSD ([lysergic acid diethylamide] for mescaline).

3. Toxic impurities or adulterants are rare.

4. Doses and concentrations of drugs may vary widely but this aspect of quality control seems to be improving. One has a general feeling that there is a bit more precision in this area than there was previously.

5. Perhaps the biggest stumbling block to interpretation of data from street drug analysis programs lies in the sampling biases which presently exist. Such biases severely limit generalizations about the prevalence and patterns of drug use. For instance divergent opinions exist as to whether drug use in a given country is on the increase or on the decrease; it is still very difficult by our present sampling patterns to really know that.

Some of the specific aspects of laboratory findings that were discussed included the following: a) material sold as LSD is usually what it is purported to be, while mescaline and psilocybin are not, but usually have their activity based on LSD content; b) PCP (phencyclidine) rarely occurs alone, but often in combination; it may be labelled as THC (tetrahydrocannabinol), but when it is combined with LSD it is frequently labelled as mescaline; c) synthetic THC itself is never found; d) cannabis and hashish are generally what they are represented to be although the quality may vary considerably. The range of values that the LeDain Commission has found is characteristic in most countries; e) cocaine is usually what it is supposed to be, give or take an occasional contamination with procaine, and is often available in fairly high concentration. A median concentration figure of 56 per cent w/w was noted in Dr. Miller's paper; others have run into even higher concentrations; f) heroin is usually what it is labelled but varies widely in concentration and methods of preparation; g) amphetamines are often what they are labelled but may show impurities as well as variable concentration, while barbiturates and other sedatives are rarely objects of inquiry as they seem to be largely derived from diversion of licit supplies and therefore their quality is generally unquestioned; h) amphetamine analogues such as 2, 5-dimethoxy-4-methylamphetamine (DOM), 3, 4-methylenedioxyamphetamine (MDA), 3-methoxy-4, 5-methylenedioxyamphetamine (MMDA), p-methoxyamphetamine (PMA), have periodic vogues; apparently DOM is "out" now, and PMA is "in", while a few years ago PMA was virtually unheard of. These, however, are usually accurately labelled although again the universal problem of varying concentration arises.

Further discussion on the second day involved the problems of biased sampling techniques. In general these tend to maximize the extent of the apparent deception and variation in the market because the sampling techniques favour the submission of problem-related samples. We may be seeing only one part of the whole spectrum; perhaps the actual situation is really better than one would deduce from the present approaches. This bias may also be reflected in the number of samples of various types of drugs submitted. For instance, a relatively low frequency of submission of samples of sedatives reflects that these supplies seem to be derived chiefly from licit sources. The same situation applies to heroin because a bioassay for it exists and users are reluctant to give up their precious supply.

Several benefits might accrue from street drug analysis:

1. Education to the user about potentially hazardous drugs on the market.
2. Assistance to physicians in treating the adverse consequences of drug use.
3. Epidemiological information about trends in drug use.
4. Assistance to law enforcement agencies about the comparative availability of the different substances. If the use of substance A is expanding in the market more efforts should be directed against that and perhaps less to substance B which may show a declining use. This is a troublesome matter which we'll pursue later.

A new and powerful technique, that of combined gas liquid chromatography and mass spectrometry, can be applied to the analysis of street drugs and to their detection in biological fluids. As the library of fragmentograms expands, the identity of various drugs will be more readily determined. Quantification is also possible by this technique assuming availability of pure standards. However, the technique is not simple, it requires expensive instruments, and it is certainly far from widely available — in fact precious few centres for such studies currently exist. The technique is most wisely used, in my opinion, to study the metabolism of drugs rather than simply to identify them.

A vexing problem in programs of street drug analysis is the communication of findings. The Addiction Research Foundation has attempted to circularize periodically parts of their results to health professionals and law officers on a limited basis. Each group seems to have specific needs from such information. Although it was reported by respondents that these newsletters were considered useful it is still uncertain whether such a procedure can hold its own against the massive onslaught of data that everyone gets. Alternative methods of dissemination of information have been considered including the poison control model of a centralized clearing house for drug information.

A clinical opinion was that the street drug analysis program might benefit drug users by alerting them to the dangers from substitution of drugs, variations in concentrations, or the presence of toxic contaminants and this might be construed as a form of preventive medicine. Perhaps the improving quality of the product has contributed to the declining incidence of adverse reactions; certainly, other aspects come into play as mentioned by Smith — the better ability of consumers to use these drugs and to manage their adverse psychological consequences. Analysis has not contributed a great deal to our understanding of some major complications of drug use such as sudden death associated with heroin injections. Many medical complications are probably due to bacteriological contamination rather than chemical. Although it is intellectually satisfying to know what drug one is dealing with in cases of overdose or adverse reactions, treatment is usually empirically determined rather than dependent upon specific antagonists, except in case of overdoses of opiates and possibly central stimulants.

Finally, the experiences of the Commission of Inquiry into Non-Medical Use of Drugs were presented. The situation in Canada indeed proved similar to, and possibly somewhat better than, that in other parts of the world. Sampling techniques were improved by making use of police seizures and drugs obtained in field studies as well as those obtained from treatment-oriented sources. As previously reported, other drugs or impurities associated with the manufacture of drugs are frequently encountered. The drugs in use were limited to a relatively few, including heroin, cannabis, LSD, amphetamine and its analogues, and PCP. At the moment drug use patterns seem to be fairly stable and predictable. Deliberate adulteration is rare and the consumer is more cheated than injured.

From here I am going to extrapolate a little and try to anticipate the direction we might like to have the rest of our discussion take. For instance, if we were to begin now on the basis of the experience of the last several years, and take a new look at street drug programs, what would we define as the goals of these programs in contemporary life? Secondly, what would be our ideal blue-print for such a program?

What I'm going to suggest to you may be coloured by the U.S. experience with two hundred million people and God knows how many drug users rather than that of Canada with 20 million people and undoubtedly even a proportionately much smaller number of users. A primary goal would be to determine the nature of street drugs, their dosage forms and the dosage strengths as these may vary in various parts of the country. These regional differences we just touched upon in our discussion but they exist in almost every country. A second goal would be to devise a systematic sampling pattern for such an analysis including cooperation with law enforcement agencies. This relates to the recurrent problem that the present sampling is highly biased, making it very difficult to generalize from the resulting data. A third goal would be to determine patterns of use of new substances or new patterns of use of old substances — for instance the shift from taking a drug orally to taking it by injection or the appearance of a relatively new substance like

PMA. And a final goal, to communicate the results as widely as possible for a maximum impact in terms of the general management of the drug abuse problem within the country. To obtain these goals what might be some approaches?

1. I would envision a series of regional laboratories based at population centres or centres of drug use. Perhaps Montreal, Toronto, Winnipeg and Vancouver might be reasonable places for a series of four such laboratories, representing a confederation of laboratories rather than isolated units. One would think that they might work together on standardization of techniques of reporting systems and so on, so that information from each could be pooled. It would probably be desirable for one laboratory to act as a reference laboratory equipped to do rather extensive analysis on a quantitative basis rather than simple identification. The logical place to do that would seem to be in Toronto at the ARF.

2. To expand services of these labs to include analyses of drugs in biological fluids when this cannot be done by local clinical labs. Clinicians often desire this information although we recognize it may be of limited utility. It should be possible to do toxicological screens with the same kinds of equipment that most of these laboratories have available for street drug analysis.

3. To establish a systematic street sampling pattern using a multiple approach. One approach can be based on street sampling by surveying and purchase. This gets to what Dr. Hart calls "street work"; I construe this as meaning asking people who are part of the drug-using culture to work with you for this constructive goal. Their aims would be to get an idea of what people are using, what they call it, what it looks like, to actually purchase samples of it, and then turn this over to the lab for analysis so that information could be made available to the using population. This would be probably the most sensitive kind of sampling technique. Additionally, there should be sampling based on seizure of drugs by enforcement authorities. Dr. Miller's report points out that seizures are very valuable sources of information. I think seizures could also be misleading. For instance, one might seize a cache of heroin of extremely high concentration yet destined for the market-place after several dilutions. Thus, one would have to exercise some judgment about just how much to rely on information of this type. Finally, there could be sampling, as it generally is now, on submitted samples, but with the addition of more history about the circumstances of submission — what provoked the submission of the sample? was it an adverse reaction? was it some fear of being cheated?

4. To communicate results of these analyses, first to individual consumers by detailed analytical reports including a summary of known effects of these drugs at specified doses and routes of administration. This would be a valuable kind of tie-in for the educational process for if you give them the straight information, and accompany it with what is known about the scientific bases for what the drug does, it might eventually help to dispel some of the abundant mythology about these drugs. One would want also to communicate the results of the whole body of information derived from these analyses. Four laboratories might pool their information in such a way that some centralized clearinghouse for street drug information could be set up, perhaps on the model of the poison control centre, with continuous telephone coverage and perhaps computerization of data so that it is readily accessible. Such a centre would require competent review of the reports by experts in the field to make sure the documentation is thorough. Finally one would communicate the results of these analyses to governmental agencies concerned with the whole problem of drug abuse so that they can have some guidelines as to the type of use, its presumed extent, changing patterns, and so on. This information might

better enable the government to formulate desirable and useful policies. As far as I can gather such information is not given much consideration whatsoever at the present time, by any legislative or law enforcement groups.

5. To encourage independent research in these laboratories or in their affiliates for studying leads derived from such analyses. One might think, for instance, of studying the combinations of drugs that appear on the street for their interactive effects. We may not learn as much as we'd like about PCP — LSD combinations by studying them in primates under operant behavioral schedules but since it would be impossible to study them directly in man, such a model might be the best alternative. One might also try to interest workers in affiliated laboratories in such studies based on new leads from actual use. Toxic reactions would require a diligent search for impurities or adulterants which might be tested systematically for toxic effects. Finally, as additional metabolites of these drugs are recognized, they might also be tested for either acute or chronic toxicity.

6. It is imperative that such a system of street drug analysis centres be given unambiguous legal status in terms of their designated function and their free access to samples of street drugs and available reference standard substances. Operation in a legal grey area seems to be intolerable any longer. They should be clearly exempt from any direct participation in law enforcement activity other than simply the submission of the same report of the analysis to the law enforcement people as to the drug user. They should not be expected to become a witness for the prosecution or to become an agency of control.

7. The financial support for such activities should be adequate and secure so as to assure the highest quality of work by highly qualified individuals.

This last section on goals is a trial balloon for what I hope will be considerably more discussion.

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